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REPORT  
OF  
METROPOLITAN PARK COMMISSION

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1895









Breakneck Hill.

Boston Bay.

Hancock Hill.

Chickatawbut Hill.

Buck Hill.

Houghton Hill.

Hoosicwhisick Pond.

Blue Hills Reservation — Looking East from Great Blue Hill.



# REPORT

OF THE

## *Board of Metropolitan Park Commissioners.*

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JANUARY, 1895.


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BOSTON:

WRIGHT & POTTER PRINTING CO., STATE PRINTERS,

18 POST OFFICE SQUARE.

1895.



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# Commonwealth of Massachusetts.

## REPORT.

The Board of Metropolitan Park Commissioners herewith submit their second annual report.

In the last report of the Board it was stated that the necessary steps had been taken preliminary to the acquisition of the Blue Hills and Middlesex Fells reservations; the Beaver Brook reservation had already been acquired; the preliminaries to the taking of the Stony Brook reservation in West Roxbury were well under way. The Board further reported that it was hoped in the early spring and during the coming summer to construct a sufficient amount of roads in both the Blue Hills and the Middlesex Fells reservations to admit the public freely to them.

This portion of the work, outlined in the original report of the commission of 1893, has now been practically completed. As the reports of the secretary of the Board and its landscape architects enter into full details both as to what has been accomplished and the methods pursued, it is sufficient here to say that the Blue Hills reservation, in the city of Quincy and the towns of Milton and Canton, was acquired in January last; and the Middlesex Fells reservation, in the cities of Medford, Malden and the towns of Melrose, Stoneham and Winchester, in February. The Stony Brook reservation in West Roxbury was acquired in April. Through these several takings a total amount of 6,070 acres has now been secured within the so-called metropolitan district. The above acreage is distributed as follows:—

	Acres.
Blue Hills, . . . . .	3,953
Middlesex Fells, . . . . .	1,583
Stony Brook, . . . . .	475
Beaver Brook, . . . . .	59
	<hr/> 6,070

To the above must be added in the case of the Middlesex Fells certain other previous takings by the water boards of the

various cities and towns in the vicinity, amounting to about 1,600 acres, a portion of which, under the terms of section 6 of the act of 1893, have been placed for maintenance, etc., in charge of the Metropolitan Park Commission, and the whole of which will, it is understood, be so placed.

As was anticipated in the last report of the Board, roads to a limited extent have been constructed in each of the reservations. In laying out and building these roads the design, in conformity with the advice of the landscape architects, has been to preserve in the greatest degree possible the natural wildness of the reservations, while insuring to the forest growth protection against fire. Costly construction of a permanent character has been avoided. Up to the present time there have been constructed 11.5 miles of road in the Blue Hills reservation and 14 miles in the Middlesex Fells, or a total of 25.5 miles of road, at an aggregate cost of \$35,861, or \$1,406.30 per mile. The usual average cost per mile of building what are ordinarily known as parkways is in the neighborhood of \$40,000, and, for the so-called Telford road, from \$50,000 to \$75,000.

It may be assumed that some 20 miles of road will ultimately be required in the Blue Hills region, some 14 miles in the Middlesex Fells and some 4 miles in the Stony Brook reservation, in order to give thorough access to them by the public and to afford every reasonable protection against danger by fire. The total cost of this amount of road is estimated at \$50,000. But the Board would call especial attention to that portion of the accompanying report of the landscape architects which relates to this subject, from which it appears that, except in so far as every reasonable precaution against ravages by fire is concerned, there is not believed to be any occasion for undue haste in further road construction.

Additional appropriations were made by the last Legislature under various acts for the further carrying out of the work entrusted to the commission. These acts were known as the Boulevard act (Acts of 1894, chapter 288), the Charles River act (Acts of 1894, chapter 509) and the Revere Beach act (Acts of 1894, chapter 483). The above acts put at the disposal of the commission an additional total sum of \$1,300,000; to wit, \$500,000 to be expended under the terms of the Boulevard act, \$300,000 under the Charles River act and \$500,000 under

the Revere Beach act. No actual expenditures of any material amount have yet been made from these several appropriations.

This apparent delay in action on the part of the commission is mainly due to the policy the Board has pursued in its work from the beginning. Recognizing the somewhat novel character of the work they have in hand, and appreciating the possible consequences which might follow any ill-considered action on their part, the members of the Board have been extremely solicitous that the appropriations put at their disposal should in no case be exceeded, while it has been their endeavor to secure the largest possible results which could be accomplished with the money actually expended. They were unwilling by any act of theirs to involve the Commonwealth or the metropolitan district in enterprises which, before completion, might entail expenses difficult at the outset to estimate. By pursuing any other course than this the commission might easily have involved the metropolitan district in some system of reservations, parkways, shore and river improvements, and especially boulevards, which the Commonwealth, when these projects had once been entered upon, would have found itself forced to complete at an expenditure of money and in a period of time impossible to estimate. The commission has accordingly entered upon any undertaking only as it saw its way to closing it up within a reasonable time, and without exceeding the appropriation at its disposal for that purpose. Should the Legislature, therefore, during its present session, conclude that the work the Board was created to do had gone far enough, and direct it to be stopped, every project the commission has as yet entered upon would be found practically complete, and the Commonwealth involved in no contingent liabilities.

The money at the disposal of the Board, by the original act of 1893, so far as it has been applied at all, has been applied as follows, the amounts stated being given in round numbers, inasmuch as all payments are not yet made, and it is therefore impossible to give exact figures : —

On account of Blue Hills reservation, . . . .	\$250,000
On account of Middlesex Fells reservation, . . . .	420,000
On account of Stony Brook reservation, . . . .	200,000
On account of Beaver Brook reservation, . . . .	30,000
	<hr/>
	\$900,000

So far as the Revere Beach is concerned, for the beginning upon which an especial appropriation of \$500,000 was made by the last Legislature, the Board has not yet seen its way to entering upon active work. As was stated both in the preliminary report of the advisory committee made in 1893, and in the first report of the commission presented a year ago, and as appears again in the report of the secretary of the Board herewith presented, the situation at Revere Beach is intricate. Vested interests of a costly description are involved, and work once begun might entail expenses so difficult to estimate in advance that, in justice to itself and with due regard to the financial interests of the Commonwealth, the commission has deemed it best to go slowly. Only recently has it succeeded in reaching anything like a reliable estimate of the probable cost of this great projected improvement. It involves three distinct elements of expenditure: first, the transfer of the Boston & Revere Beach Railroad line from its present roadway to a roadway farther removed from the water; secondly, the construction of a boulevard along the roadway thus vacated; thirdly, the removal, either wholly or to a great degree, of the existing structures scattered along the beach between the proposed boulevard and low-water mark.

The cost of these various portions of the proposed work has now been estimated as follows:—

Transfer of the roadway, . . . . .	\$300,000
Construction of boulevard, . . . . .	125,000
Acquisition of all riparian and other rights between the proposed boulevard and low-water mark, . . . . .	500,000
Under-estimates and contingent expenses, . . . . .	75,000
	<hr/>
	\$1,000,000

Meanwhile, should it be thought that so large an expenditure was not justifiable at this time for the purpose proposed, results of a less satisfactory character could be obtained through constructing the boulevard without acquiring the whole of the land between the boulevard and low-water mark. By pursuing this course it is estimated that the expense of the proposed work would be temporarily reduced \$250,000. In such case the immediate cost of the enterprise would be in the neighborhood of \$750,000. On the other hand it should be clearly





*Photomicrograph*

*John J. Howard & Son*

BEAVER BROOK RESERVATION.  
*The Brook.*



understood that such a saving would be only apparent, as in case the boulevard was constructed, all the land between it and low-water mark would have to be ultimately acquired, and if not acquired at the outset, would probably cost much more hereafter than now.

The commission has not felt at liberty to enter upon so costly an undertaking without fully advising the Legislature of the liability involved in it. They have, therefore, of the amount put at their disposal for this purpose, to wit, \$500,000, expended in plans and preliminary work up to this time \$1,026.73. Should the Legislature, with the information thus given, desire to have the work continued, certain additional legislation will be necessary, and the Board can then proceed at once. Should it, on the other hand, feel that the expense involved is more than the result would justify, nothing has been done which would commit the Commonwealth to any further expenditure.

In this connection, however, it may not be inappropriate for the Board to call attention to the fact that, while the cost of the proposed improvement seems large, through it the control and enjoyment forever of one of their great ocean beaches would be secured to the inhabitants of the Commonwealth; while, on the other hand, three public edifices in Boston alone — the State House, the Court House and the Public Library — have each of them cost from two to five times the amount needed to secure for all time this great result.

The last Legislature appropriated the further sum of \$300,000 for the purchase of land in the Charles River basin. In this matter also the commission has deemed it wise, with a view to all the interests involved, to proceed cautiously. Careful estimates have been made which would seem to indicate that to acquire all the land it is desired now to acquire along the Charles River would involve an expenditure of between \$400,000 and \$500,000. The commission has taken steps towards immediate acquisitions to the extent of the amount put at its disposal, to wit, \$300,000. That appropriation, therefore, may now be considered as having been applied.

The Board wishes furthermore to record its sense of the importance of this improvement from the park or reservation

point of view, if carried out in general accordance with the plan of the joint Board of Health and Metropolitan Park Commission report submitted to the last Legislature. In so far as the proposed dam across the mouth of the Charles in the vicinity of Craigie's bridge would affect questions of health, or in so far as the reduction of tidal flow might or might not affect Boston harbor injuriously, it is in no degree within the province of this Board to express an opinion. But confining themselves strictly to their own province, that is, the question of reservations for public use and enjoyment, the commissioners are confident that there is no project now under consideration which, in its general scope and as a public benefaction, will at all compare with that of the proposal to convert the Charles River between the Watertown dam and Craigie's bridge from a tidal estuary to a permanent water-level basin. Not only would this change greatly simplify the difficult question of treating the marshes and other low lands along the shores of the river in Brighton, Cambridge and Watertown, enabling those entrusted with the work to accomplish the desired results at a greatly reduced cost, but it would have the further effect of supplying the dense populations inhabiting the above-named cities and towns with a water park the use and enjoyment of which it would at present be difficult to estimate. Every one at all familiar with these subjects is well aware of the great use now made of that portion of the Charles known as Riverside, lying between the dam at Waltham and Newton Lower Falls. In spring, summer and autumn, not only on Sundays and holidays but upon almost every pleasant week-day, this stretch of water is alive with row-boats of every description; in winter it is covered with skaters. The immediate result of converting the Charles above Craigie's bridge into a permanent level-water basin would be to bring the Riverside section down to Charles Street in Boston. In the summer this expanse of water would swarm at all hours of the day and evening with pleasure craft of every description; in the winter it would afford an opportunity for a skating carnival. The large and increasing number, especially of the young, who in Boston and Cambridge enjoy these forms of relaxation, would thus have them brought to their doors; and instead of, as now, being compelled to seek them at distant points, like Jamaica Pond, the Dedham meadows and Riverside, they would obtain



them by simply walking down to the esplanade in the rear of Beacon Street or to the numerous steps and landings which would be found in the immediate vicinity of Charles Street. For these and other hardly less obvious considerations the commissioners feel that they cannot too strongly emphasize the desirability, from their point of view, of the improvement last year recommended. In no other way could so much healthy enjoyment through so many months in the year be afforded, at an equal expense, to the same number of persons within the metropolitan district; while the increased beauty due to this great water park could hardly fail to add greatly to the value of all adjacent property for purposes of residence.

In the matter of the boulevards, so called, or special parkways for access to the reservations, for which an appropriation of \$500,000 was made, the commission has had a variety of schemes under careful advisement, and has practically decided upon certain among them. Nevertheless, in this matter also the possible expense which might be entailed was so difficult to estimate, and the character and extent of the work if once entered upon was so indefinite, that the commission has felt that it was wiser and safer to proceed with great deliberation. No actual work has yet been begun, but an amount of boulevard, or ways of access to the park system, estimated to require all the money, to wit, \$500,000, placed at the disposal of the commission under the act referred to, has been decided upon in the cities of Medford and Malden, and in the towns of Milton and Winchester.

In this connection the commissioners desire now to say that they cannot but entertain grave doubts as to the expediency of entering, at the present time, upon the line of development proposed. In their judgment it is premature. The landscape architects have in their report herewith submitted developed a scheme of connecting avenues and parkways which at the proper time it might be well to consider in its entirety. To it the commissioners now call attention; but, on the other hand, as matter of present policy, it is to be remembered that not only the whole system of reservations, but the metropolitan district itself, are yet in the purely formative stage, hardly more than experiments; and in such cases it is not well to attempt too much at once.

It is also to be remembered that the several reservations already in part secured have not been wholly paid for, nor is it yet fully apparent to what extent they will be used by the public in that immediate future for which only provision need now be made. To proceed at once, therefore, to connect these undeveloped takings with each other and with the distant centres of population by a costly system of thoroughfares or boulevards, does not commend itself to the judgment of the Board. It is attempting too much at once.

The schemes referred to as now decided on by the Board under the provisions of the Boulevard Act are all directly connected with and subsidiary to the plan of the reservations as so far developed. At least, the necessary land will be secured at prices less than will probably rule when the work the Board has in hand is further developed, and its effect on adjacent property has made itself felt; and thus, while no harm will have been done, a positive future advantage may be secured. As respects construction, which in the case of park boulevards of a high standard is costly, — averaging from \$50,000 to \$100,000 per mile, — the commissioners have not deemed it necessary to do immediately better work or spend more money than seemed called for under existing conditions. Future needs can be safely left to be provided for through future appropriations; and the hearings already had seem to give some cause for apprehension that, with a body so loosely compacted as the present metropolitan district, any work thus entered upon, or expense incurred, for what may appear to be local purposes or under local pressure, will, when the task of apportioning the cost thereof is undertaken, excite jealousies and dissensions which at this stage of development would be unfortunate. The pressure for the construction of expensive local thoroughfares at the supposed charge of the metropolitan district in general has already made itself felt; and while the Board, confining its attention strictly to the needs of the reservations, has in no way yielded to this pressure, yet it has been apparent that each undertaking would constitute a precedent, and what is done in one locality would be made the basis of a demand that something similar or of equal extent should be done in other localities.

While, therefore, the Board has prepared the necessary plans, and is about to enter upon the construction of the park-

BLUE HILLS RESERVATION.



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Amherst, Mass.



ways which have been decided upon to the extent of the sum now at its disposal, it has done so with reluctance, and takes this early occasion to record its hope that, until at least the reservations are fully secured and paid for, and the highways within their limits made part of them and reconstructed as such, the matter of external thoroughfares and distant approaches may be left in its hands purely as a matter of study in connection with the natural process of development. In the judgment of the commissioners, it calls for no material immediate expenditure of money.

As the case now stands, therefore, the entire amount of \$1,000,000 originally placed at the disposal of the Board under the act of 1893 either has been expended or is in the process of expenditure.

The \$300,000 appropriated and placed at its disposal by the act of 1894, known as the Charles River act, may be considered to have been applied.

The \$500,000 put at its disposal by the act of 1894, chapter 288, known as the Boulevard act, may also be considered as applied, subject to possible legislative action.

The \$500,000 put at the disposal of the Board by the Revere Beach act (Acts of 1894, chapter 483) has not been irrevocably applied, except for the comparatively small items, to the amount of \$1,026.73, which have been charged against it.

Of the total of \$2,300,000 placed at the disposal of the Board under all the various acts of the years 1893 and 1894, it may be assumed in round numbers that the sum of \$1,801,026.73 has either been expended or applied in such a manner as to make the treasury of the Commonwealth liable therefor.

So far as the reservations proper are concerned, — constituting more especially the province of the Board, — the results already accomplished are by no means inconsiderable. These reservations have been acquired, and to a limited extent made accessible to the public. As already stated, should the Legislature put in the hands of the commission the necessary additional money, they can be opened in the immediate future to a yet more considerable extent. Whatever work has been done has, it is believed, been done upon terms which, so far as first



cost is concerned, are open to no fair criticism, and no further liabilities have been incurred, either on account of work already done or upon work which is projected.

Finally, the cost of suitable maintenance has exceeded, and seems likely hereafter to exceed, the original estimates of the Board. This is due to the necessity of proper policing. The cost of maintenance could be at once reduced to a comparatively insignificant amount; but, if this policy were pursued, it would be necessary to reduce the police, exposing those who frequent the reservations to the danger of more or less annoyance through violations of the peace, while all protection against fire would practically be withdrawn. Under these circumstances, until otherwise instructed, the Board has not felt that it was justified in pursuing a course different from what has been pursued. The present cost of maintenance, including policing, amounts to about \$5 per acre per annum.

The usual accompanying reports of the secretary and the landscape architects of the Board are herewith transmitted.

All of which is respectfully submitted.

CHARLES FRANCIS ADAMS.

PHILIP A. CHASE.

WILLIAM B. DE LAS CASAS.

ABRAHAM L. RICHARDS.

WILLIAM L. CHASE.



*Photograph*

MIDDLESEX FELS RESERVATION.

*John Andrew & Son*





## REPORT OF THE SECRETARY.

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CHARLES FRANCIS ADAMS, *Chairman, Metropolitan Park Commission.*

SIR: — At the time of the making of my first report to the Board as its executive officer there had been taken for public park purposes the Beaver Brook reservation, with an area of 58.61 acres, and a portion of the Blue Hills reservation, *i. e.*, the western of the four sections into which the reservation is divided, containing  $932\frac{1}{2}$  acres, — that is, altogether a little short of 1,000 acres. These areas, although taken at a time which was comprehended within the limits of my first report, had been in the hands of the commission but a few weeks when that report was submitted, and therefore for all practical purposes may be considered a part of this year's work.

On Dec. 29, 1893, the eastern and east middle sections of the Blue Hills reservation were taken by act of the Board, followed on Jan. 5, 1894, by the taking of the west middle section, thereby completing the Blue Hills reservation, an area of 3,953 acres. On February 2 there were taken 1,583 acres in the cities of Malden and Medford and the towns of Winchester, Stoneham and Melrose, which, with the water reservations in the vicinity of Spot Pond and the Winchester reservoirs, comprise the Middlesex Fells reservation, an area of about 3,200 acres.

On April 30 the first or preliminary takings were made for the Stony Brook reservation, including a portion of the West Roxbury parkway, followed, on September 6, by the final takings in Hyde Park and West Roxbury, including an area of 475 acres.

It having been decided that the interests of the metropolitan community, especially of the city of Boston, would be best subserved by the connecting of the Stony Brook reservation with the Boston Park system, an agreement was entered into

between this commission and the Boston Park Commission whereby takings should be made at the same time by both Boards for a parkway extending from the Arnold Arboretum to the Stony Brook reservation by the way of Bellevue Hill. In accordance with this agreement, this commission on October 18 made two takings, including an area of 156 acres, of that portion of the parkway between Weld Street and Washington Street, being the Bellevue Hill section. This left the portion from Weld Street to the Arnold Arboretum, which was taken by the Boston Park Commission practically at the same time, thereby making the connecting link between the two park systems. It was further a part of this understanding that upon the taking by this commission of the land the Boston Park Commission should assume the construction, care and maintenance of that portion taken by this Board for a term of nine hundred and ninety-nine years.

This transfer, made December 20, has been duly approved by the mayor and city council of Boston, as required by the statute; and it therefore becomes a part of the duty of the Park Commissioners of Boston to construct and maintain this connecting link. By the foregoing acts of the commission, 6,225½ acres have been taken from the following cities and towns: —

In the Blue Hills reservation: —

	Acres.
From Quincy, . . . . .	2,530
Milton, . . . . .	1,314
Canton, . . . . .	109
Total, . . . . .	— 3,953

In the Middlesex Fells reservation: —

From Malden, . . . . .	61
Medford, . . . . .	362
Winchester, . . . . .	287
Stoneham, . . . . .	668
Melrose, . . . . .	205
Total, . . . . .	— 1,583

In the Stony Brook reservation: —

From Boston, . . . . .	190
Hyde Park, . . . . .	285
Total, . . . . .	— 475

In the Beaver Brook reservation : —

From Waltham, . . . . .	42 $\frac{1}{2}$	
Belmont, . . . . .	16	
Total, . . . . .	—	58 $\frac{1}{2}$

In the West Roxbury parkway : —

From Boston, . . . . .	156
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All of the above lands were taken under the original statute (chapter 407, Acts of 1893), to be paid for out of the metropolitan parks loan, as provided in that act.

Immediately upon acquiring these reservations the task of adjusting the claims of their owners against the Commonwealth was undertaken and prosecuted with as much speed as was possible, on account of the difficulties which had to be surmounted in arriving at any proper and accurate knowledge of boundaries and ownerships in lands which in many cases had probably never been surveyed. It may be safely said that never before in the history of this community have such large tracts of land been dealt with as in the case of the two larger reservations, or under such adverse conditions as to existing knowledge or data concerning boundaries and ownerships.

In the Blue Hills reservation, a tract of nearly 4,000 acres, including within its limits almost no land other than that of a wild nature, wholly unfit for agricultural or building purposes and only used heretofore as woodland, of slight value, it is apparent that ownerships should in many cases have been uncertain and that private boundary lines should have been extremely difficult to determine. Add to this the total disappearance of many of the objects used in defining boundaries when the property was last deeded, such as "piles of stones," "pine trees" and other such perishable monuments, and an idea can be formed of the difficulty which was encountered in this phase of the work of settlement. In this reservation there were probably in the vicinity of 175 different owners, their holdings varying in extent from a few feet, where the taking line lopped off the corner of some adjoining estate, to large single holdings of upwards of 170 acres. When the determination of the boundary lines had been reached, the equally difficult question of the real ownership was the next step in the process of settlement. Here, however, the conveyancers of the commission were met

with a condition unusual and difficult in many ways to deal with. A very considerable portion of the territory in the Blue Hills had descended from father to son or daughter and thence to grandchildren and great-grandchildren, no deeds having in this interval been passed. In consequence the task of hunting up forgotten heirs and tracing inheritances, as well as the forwarding of deeds to all parts of the country to obtain the signatures of heirs to undivided portions, delayed the examination of titles and the settlement of estates for a considerable period of time.

What I have said of the difficulties encountered in the Blue Hills in the matter of boundary lines and of titles applies in a somewhat less degree to the Middlesex Fells, where the greater value of the property had led to more careful determination of boundaries by private owners in the near past. Still, in the case of this reservation, with its upwards of 100 owners, the difficulties were sufficiently serious to require a considerable time, although the work has progressed in the main very satisfactorily.

In the Blue Hills reservation all but about 35 owners, with an aggregate holding of about 350 acres out of the 3,953 acres, have either been paid or have been settled with, and the papers are in process of preparation for the final passage of the deeds releasing all claims against the Commonwealth; in the Middlesex Fells 450 acres out of the 1,583 have been settled; in the Beaver Brook reservation 13 acres out of the 58 have been settled; and in the Stony Brook as yet very little has been attempted in the way of settlement.

In every case what was believed to be the full value of property taken was allowed to every owner coming forward with a proposition to settle his or her claim. In no case has there been any attempt made to obtain property for less than a fair market price; and the willingness of the commission to pursue this fair and honorable course has without doubt affected very favorably the settlement of these estates, as is evidenced by the fact that the commission has been obliged to litigate but one claim, and but two or three other owners have as yet entered suits to establish their claims. The cost of the Blue Hills reservation for land taken which has been paid for has been \$194,361.91; of the Middlesex Fells reservation, \$85,574.60; of the Beaver Brook reservation, \$11,000; of the Stony Brook reservation, \$8,000; and the West Roxbury parkway, \$37,014.

Simultaneously with the settlement of the claims for land taken came the organization of the forces to be employed in the reservations; and for this general administrative purpose the various reservations were divided into sections, each section having some distinct and natural boundary, suggested by the topography of the reservation. To carry on this work there was at first a small force of men employed in the Blue Hills reservation with an overseer in immediate charge, into whose hands was also given the superintendence of the other reservations as they were successively taken by the Board. Later a more perfect organization was effected by the appointment of Mr. Wilfred Rackemann, the former overseer, as general superintendent, and by the appointment of a resident superintendent in each of the four reservations. The forces were then, according to the number of men employed, divided into gangs of from seven to twenty men, each with a foreman in charge directly responsible to the resident superintendent, who in turn was responsible to the general superintendent, through the secretary to the Board.

When the dry season of April and May had come, the necessity for the appointment of a police force who should act, not only for the purpose of preventing infringement of the ordinary rules governing the community at large, but also more especially to protect the reservations from the danger resulting from the lighting of fires, and to be constantly patrolling the reservations to detect any fire which might have been started by accident, and, by giving quick notice of the locality of the said fire to the other forces in the reservation, to prevent the disastrous spread of the flames. For this purpose there was appointed last spring a force of six policemen with a chief at their head in the Blue Hills reservation, and in the Middlesex Fells reservation five officers; followed this fall, upon the acquiring of the Stony Brook reservation, by the appointment there of two officers. In all the reservations other than the Blue Hills, which on account of its great size necessitates a rather more careful and constant oversight, the resident superintendents are the chiefs of police, and have the direction and control of the officers in the reservations in the same manner as the other forces.

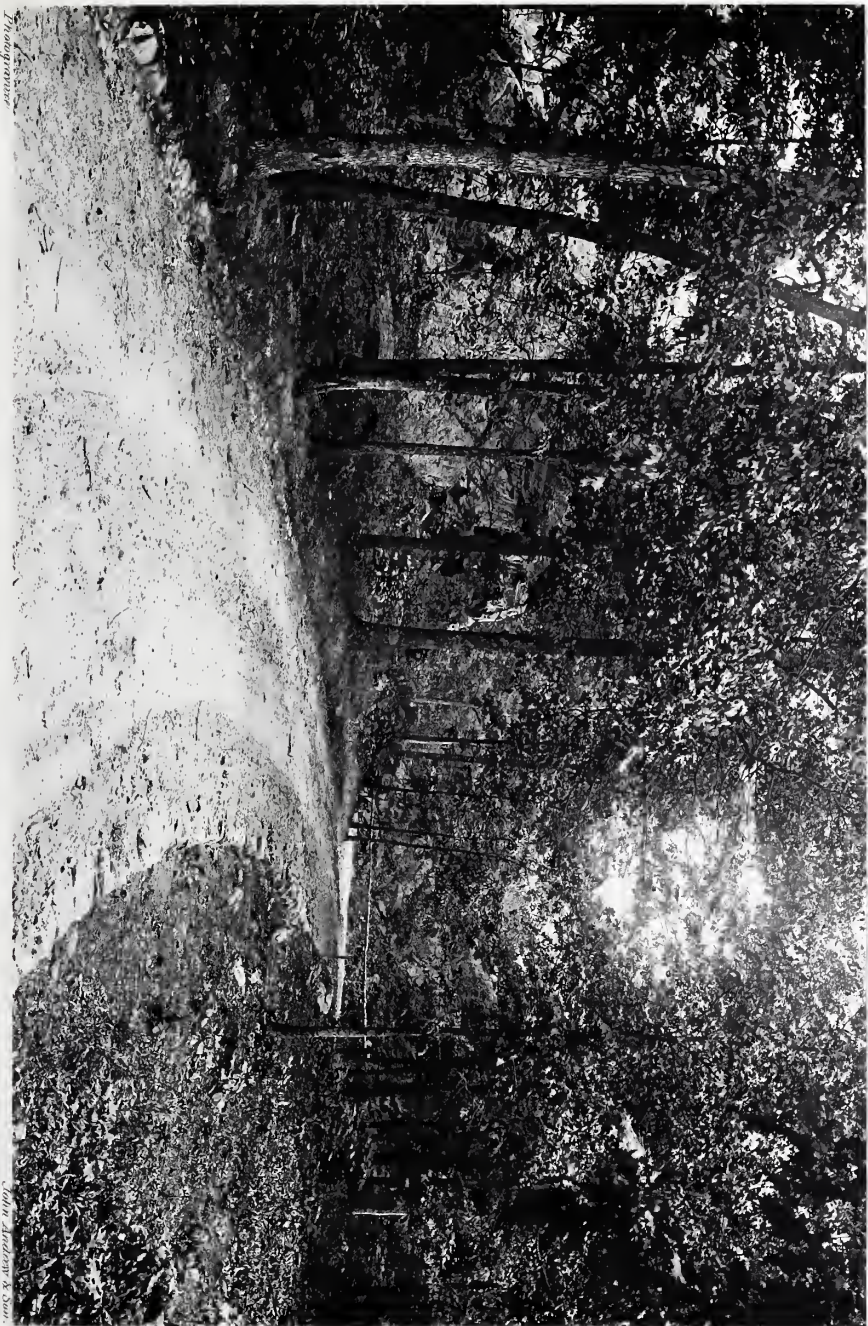
While there have been a very considerable number of small fires started by various causes in the several reservations during



the past year, it reflects great credit upon and attests the faithfulness of the police forces that all of these fires have been extinguished in their incipiency, resulting in no appreciable damage in any case. It is further a noteworthy fact that this is the first year for a long period in which extensive and disastrous fires have not occurred on these same tracts of land.

With the organization which has been outlined and the forces which were placed under this organization the performance has been of no inconsiderable importance. The first and most important work was that of dealing with the dangerous condition of the woodlands, owing to their total neglect, in most cases for long periods of time, if they had ever received any careful treatment by their former owners. In nearly every case the woods were in the best possible condition for the spreading of forest fires, the great enemy of the American woodlands; and, therefore during the months of January, February and March the energies of the executive department were exercised to effect a partial degree of safety by means of removing dangerous debris from certain wood paths designated for the purpose of fire stops. It was of course manifestly impossible, in the space of three short months, to attempt any general cleaning of the woods; and all that could be done was to separate into large areas these reservations, making of the wood paths above mentioned fire guards of a width of from two to three hundred feet, thus making it possible, if a fire originated in any of these divisions, to hold it from crossing these cleared strips. This work was practically accomplished, and the Blue Hills and Middlesex Fells reservations by early April were separated into a large number of divisions, no one of which was of such size that a fire occurring within it would have destroyed any considerable portion of woodland.

But work of this kind was brought to a close necessarily by the advent of the season when the necessary burning of the dead brush became dangerous because of the dry condition of the surface of the ground. The high winds of March and early April, contrary to the popular impression, render this season of the early spring the most liable to forest fires of any period of the year. Hence work of the character above described was brought to a close, and the second and only other work which has been attempted was inaugurated, viz., the placing



Photomicrograph

MIDDLESEX FELS RESERVATION

John Anderson & Son





of certain of the wood paths in fairly passable condition and the construction of a few administrative roads.

This work occupied the forces, which were materially reduced after the beginning of the warm weather, during the entire summer and fall; and as a result there have been constructed in the Blue Hills reservation over  $11\frac{1}{2}$  miles of fairly passable roads, at a cost of \$1,509 per mile, while in the Middlesex Fells reservation there have been opened to public use nearly 14 miles of such roads, at a cost of \$1,322 per mile. The public were quick to avail themselves of these temporary roads, and each week during the latter part of the summer and fall showed an ever-increasing use by the public of the slight convenience made possible by the summer's work.

I would, however, most strongly recommend that there be no more road construction attempted by the commission until such time as the topographical survey now in process shall have been completed, which I have every reason to believe will be in a little over a year from this time, when a proper determination can be made of the location of the permanent roads. Enough of these temporary roads have been opened for the enjoyment of the public and for all the necessary administrative purposes of the commission. By means of guide boards the public can be directed to most of the points of interest in the reservations which will afford, during the coming spring, summer and fall, great enjoyment to the people of the metropolitan district. If any further work of this kind should be attempted it would be more than probable that it would interfere seriously with the appearance of the reservations when the permanent roads are constructed. This, however, does not apply to the boundary roads of the reservations, as the boundaries were in the first instance largely determined on account of the suitability of the grades for the construction of a road along their lines. Hence during the coming summer such forces as are employed by the commission would, it seems to your executive officer, be more wisely employed in building these so-called boundary roads than attempting any further openings into the interior of the reservations themselves.

As the winter season of 1894 and 1895 began at a much earlier period than usual, the work of construction of roads, except in one instance in the Middlesex Fells reservation,

ceased early in November. The forces were then directed to the clearing of the woods in the areas between the fire guards which had been opened during the previous winter and spring, and are engaged and will continue in this work until the opening of the coming spring.

The Legislature of 1894 passed three acts appropriating sums of money for certain specific objects, and charged this Board with their expenditure. They were as follows: "An act authorizing the construction of roadways and boulevards," being chapter 288 of the Acts of 1894, appropriating the sum of \$500,000. By the terms of this act the commission was authorized to connect any road, park way or other open space with any part of the cities and towns of the metropolitan parks district under its jurisdiction by a suitable roadway or boulevard. "An act authorizing the partial taking of the location of the Boston, Revere Beach & Lynn Railroad," etc., chapter 483, Acts of 1894. "An act authorizing additional expenditure by the Metropolitan Park Commission for open spaces near the Charles River," chapter 509, Acts of 1894.

Under the first of these acts, or the boulevard act, so called, inquiry was at once begun to determine the locality, direction and objective points within the metropolitan district most desirable to connect by boulevards or parkways. Engineers and surveyors were at once placed in the field to investigate these questions, which were pushed ahead as rapidly as it was possible to do so during the summer and fall months. The question has been considered at nearly every meeting of the Board since the late spring, and the routes upon which the Board have looked with most favor have been those where the takings would involve the least expenditure for land consistent with the largest use and benefit to the public. There has also been a small amount of construction carried on under this act along the boundary roads of the two larger reservations. But only on these two items have any expenditures been made under the authority of this act.

Under the second of the acts above referred to, viz., that for the partial taking of the location of the Boston, Revere Beach & Lynn Railroad in the town of Revere, no action other than that of investigation and negotiation has as yet been attempted. The whole question of the Revere Beach reserva-



Photography

BEAVER BROOK RESERVATION.

*The Falls.*

John A. Hartman & Son



tion is an extremely intricate one, involving vested rights to such an extent that undue haste would unquestionably cause an unwarranted and unwise expenditure. Therefore, although much time has been spent on this question by the engineer and surveyor, as well as in an investigation of questions concerning the values of property, no final action has as yet been taken.

Under the third and last of these acts, that relating to the Charles River, action has been delayed owing to the uncertainty of the final decision of the Legislature as to the treatment of the basin between Cottage Farm and Craigie bridge. However, the work of the determining of owners of the property and the areas which it would be desirable to take between Cottage Farm and the Waltham-Watertown line, as well as the ascertaining of the values of the property, has been practically completed, and everything is ready, so far as this department is concerned, for the immediate action of the Board whenever it shall see fit.

Respectfully submitted,

H. S. CARRUTH.



## FINANCIAL STATEMENT.

*Jan. 1, 1894, to Dec. 22, 1894.*

Metropolitan parks loan, . . . . . \$1,000,000 00

*Expenditures.*

## Blue Hills reservation : —

Land, . . . . .	\$194,361 91	
Labor, . . . . .	28,544 08	
Engineering, . . . . .	1,179 26	
Landscape architects, . . . . .	750 00	
Legal expenses, titles, . . . . .	10,547 83	
Legal expenses, snits, . . . . .	5,544 00	
Material, . . . . .	1,850 70	
Expenses of land settle- ments, . . . . .	2,323 22	
Miscellaneous, . . . . .	1,461 29	
Total, . . . . .	—————	\$246,562 29

## Middlesex Fells reservation : —

Land, . . . . .	\$85,574 60	
Labor, . . . . .	15,852 43	
Engineering, . . . . .	1,268 92	
Landscape architects, . . . . .	750 00	
Legal expenses, titles, . . . . .	4,610 63	
Material, . . . . .	1,139 91	
Miscellaneous, . . . . .	1,135 93	
Total, . . . . .	—————	110,332 42

## Beaver Brook reservation : —

Land, . . . . .	\$11,000 00	
Labor, . . . . .	2,361 61	
Engineering, . . . . .	500 46	
Legal expenses, titles, . . . . .	75 00	
Repairs, . . . . .	1,284 03	
Construction, . . . . .	1,502 50	
Miscellaneous, . . . . .	473 54	
Total, . . . . .	—————	17,197 14

<i>Amounts carried forward,</i> . . . . .	\$374,091 85	\$1,000,000 00
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*Amounts brought forward,* . . . \$374,091 85 \$1,000,000 00

Stony Brook reservation : —

Land, . . . .	\$8,000 00	
Labor, . . . .	2,110 30	
Engineering, . . . .	1,238 62	
Legal expenses, titles, . . . .	225 00	
Miscellaneous, . . . .	315 76	
Total, . . . .	<hr/>	11,889 68

Revere Beach reservation : —

Engineering, . . . .	\$481 00	
Legal expenses, . . . .	450 00	
Miscellaneous, . . . .	95 73	
Total, . . . .	<hr/>	1,026 73

West Roxbury parkway : —

Land, . . . . .	37,014 00	
	<hr/>	424,022 26
		<hr/>
Office expenses, . . . . .	\$1,506 09	
Travelling expenses, . . . . .	1,429 21	
Miscellaneous expenses, . . . . .	1,607 91	
Law expenses, . . . . .	56 10	
Salaries, . . . . .	3,953 65	
Maps and books, . . . . .	13 80	
Rent, . . . . .	1,561 49	
	<hr/>	10,128 25
		<hr/>

Balance metropolitan parks loan, . . . . \$565,849 49

Appropriation (Acts of 1894, chapter 288), known as the  
boulevard loan, . . . . . \$500,000 00

*Expenditures.*

General expenses : —

Engineering and surveying, . . . .	\$9,777 45
Landscape architects, professional ser- vices, . . . . .	500 00
Landscape architects, district map, . .	881 95
Landscape architects, expense account, .	415 88

Blue Hills boundary : —

Labor, . . . . .	4,740 17
Engineering, . . . . .	400 18
Tools, . . . . .	71 33

<i>Amounts carried forward,</i> . . . .	<hr/>	<hr/>
	\$16,786 96	\$500,000 00

<i>Amounts brought forward,</i>	. . .	\$16,786 96	\$500,000 00
Middlesex Fells boundary :—			
Labor,	. . . . .	7,642 83	
Engineering,	. . . . .	111 28	
Tools,	. . . . .	26 89	
		<hr/>	24,567 96
Balance boulevard loan,	. . . . .		\$475,432 04
Appropriation (Acts of 1894, chapter 509), known as the			
Charles River loan,	. . . . .		\$300,000 00

*Expenditures.*

Engineering, etc.,	. . . . .	\$1,251 36	
Landscape architects, expense,	. . . . .	126 38	
		<hr/>	1,377 74
Balance Charles River loan,	. . . . .		\$298,622 26
Appropriation, care and maintenance,	. . . . .		\$20,000 00

*Expenditures.*

Salaries,	. . . . .	\$1,701 60	
Police pay roll,	. . . . .	8,482 02	
Labor,	. . . . .	1,187 28	
Material,	. . . . .	882 14	
Tools,	. . . . .	2,548 99	
Repairs,	. . . . .	265 92	
Landscape architects, expenses,	. . . . .	666 45	
Sign boards,	. . . . .	376 80	
Tool houses,	. . . . .	776 00	
Horses and teams,	. . . . .	1,201 00	
Stationery,	. . . . .	232 49	
Surveying,	. . . . .	297 60	
Expressage,	. . . . .	52 55	
Furniture,	. . . . .	40 38	
Printing,	. . . . .	42 62	
Miscellaneous,	. . . . .	983 40	
		<hr/>	19,737 24
Balance,	. . . . .		\$262 76



Photomicro



BEAVER BROOK RESERVATION.

The Oaks

John A. B. B. B.



## LANDSCAPE ARCHITECTS' REPORT.

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CHARLES FRANCIS ADAMS, *Chairman of the Metropolitan Park Commission.*

SIR:—The undersigned respectfully submit the following report for the year 1894:—

### PART I.—CONCERNING ACQUIRED RESERVATIONS.

#### SECTION 1.—OF THE DETERMINATION OF THE BOUNDARIES.

At the date of this writing the open spaces which have been acquired for the public by the commission are the Blue Hills, the Middlesex Fells, the Stony Brook and the Beaver Brook reservations. The preliminary Metropolitan Park Commission, in its report of January, 1893, had suggested the purchase of lands at these places among others, and both the public and the Legislature had approved the suggestion; but the areas to be acquired and the bounds to be established had not been determined when the executive Metropolitan Commission was created by the act of June, 1893. Accordingly, when we were summoned to assist the commission in September, 1893, it was the problem of the boundaries of the lands to be acquired which was first assigned to us.

Speaking generally, it has not been the habit of park commissions to give much attention to the boundaries of public domains. It is generally easier to acquire the whole of a given parcel of real estate, though half of it is not really wanted, and then to omit the purchase of any of the next parcel, though half of that is sadly needed, than it is to acquire a part from this and a part from that for the sake of obtaining what is essential and omitting what is of less importance to the landscape of the domain to be preserved. There are few public grounds which are not grossly deformed by the imperfections

of their boundaries. Almost everywhere the immediate saving in time and trouble for the surveyor, the conveyancer and the commission concerned has worked permanent injury to public interests in public scenery.

Accordingly we took up the detailed study of the bounds of the proposed reservations with peculiar interest. In each case the object had in view was much the same; namely, the carving out from the conglomerate mass of private estates such a body of land as in each locality seemed essential to the achievement of the purpose of the proposed new public estate, — that purpose being in each case the preservation of the best of the scenery of the tract in question.

At Beaver Brook, concerning the bounds of which reservation we reported on Nov. 13, 1893, the area to be acquired was small, the boundaries of the existing estates were visible or well known, and the problem was comparatively a simple one.

At Middlesex Fells the natural boundary at the base of the wall of the plateau was found to be hopelessly beyond reach in many places, either because of the high price of open land which proximity to towns had induced, or because buildings had already been placed on the slope of the highland region. Across Medford a natural boundary was put out of the question by the Legislature, which prescribed a straight line south of which no lands could be taken. Thus the boundary for the Fells which we suggested in a report dated Dec. 15, 1893, was of necessity a compromise line, lying generally in the right position, but turned aside from its true course in many places by force of circumstances beyond our control; in other words, by the legislative line in Medford, and by high land values such as would not have been encountered had the metropolitan commission begun its labors a few years earlier.

At Stony Brook and in the Blue Hills the field was freer. To preserve the desired valley at Stony Brook required a reservation two miles long, and to secure the whole range of the Blue Hills a domain five miles in length proved necessary; yet neither of these large tracts touched high-priced lands save at their ends. The method of procedure, both here and at the other reservations, was as follows. In the first place, we provided ourselves with the best obtainable maps. These were generally the ordinary lithographed township maps and the

mile-to-an-inch general map of the Boston metropolitan district. Armed with these wholly inadequate guides, one of us, with an assistant, personally explored the woods and thickets which clothe the bases of the Blue Hills and the flanks of the Stony Brook valley, and gradually determined on the general course which the particular boundary in question ought to take in order to fulfil the main purpose in mind, as well as to make it generally practicable to build a road upon the boundary in the future.\*

The general absence of visible property lines or other landmarks made this blind work, but the autumn weather of 1893 was favorable and good progress was made. As soon as the general course of any considerable stretch of boundary was thus selected, a surveyor's transit line was run along it, frequent stations being numbered both on the ground and on a map drawn on tracing cloth to the adopted scale of two hundred feet to an inch. By measurements taken from these stations and afterwards plotted on the tracing, the proposed boundary was more exactly defined; and then sun-prints taken from the tracing were submitted to the commission and to the local authorities for approval. When approved, the surveyors defined the projected lines by accurately measured distances, radii of curves and the like, while the legal advisers of the Board drew the papers required to accomplish the act of taking by eminent domain. Speaking generally, but very few private property lines had been either discovered or mapped at the time the takings were made. The search for these lines and for the owners of the estates acquired has proved a difficult task, which we understand is still occupying the surveyors, the conveyancers and the secretary of the commission.

Our work upon the problem of the boundaries of the four acquired reservations was substantially concluded when we addressed our semi-annual report to the Board on July 1, 1894. The number of miles of alternative and adopted boundary lines studied and mapped by us, with the assistance of the surveyors, in the manner thus described, exceeded thirty.

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\* For a summary of the general principles which should govern the determination of the boundaries of public reservations, see report of Olmsted, Olmsted & Eliot, and printed with the first annual report of the Metropolitan Park Commission.



## SECTION 2. — OF THE EXPLORATION OF THE ACQUIRED LANDS.

As one new reservation after another was secured by the commission, many questions of management and policy at once arose, and seemed at first to call for immediate answer. It was said that numerous carriage roads ought to be opened immediately; that woodsmen ought to be put to work to save the finer specimens or sorts of trees from being strangled by the inferior; that ten thousand dollars, if so much was necessary, ought to be spent in making the old road up Great Blue Hill safely passable by pleasure carriages; and so on. We, on the other hand, as the responsible professional advisers of the commission, felt it incumbent upon us to urge caution in all these matters. We took the ground that, the reservations having been acquired, a sufficient number of keepers placed on guard and numerous fire lines cut through the worst of the dead timber, there was no haste whatever about any further doings. It was pointed out that the metropolitan community had caused the commission to assume possession of these large reservations, not for the sake of making an exhibition of fine trees, economic forestry, model roads, or any other special thing or things, however desirable, but simply in order to provide itself with ample preserves of fine scenery; and consequently that all work done within the reservations ought to be directed solely to preserving, enhancing or making available the charm, the beauty or the impressiveness of that scenery.

If this opinion were just, it would be imprudent for any man, however adept, to undertake to determine how a road ought to turn and climb among the Blue Hills so as to give as much pleasure as possible, while injuring the landscape as little as possible; or how trees should be felled at Stony Brook so as best to develop the hidden beauty of the glen; or how or whether planting should be done in the few openings in the Fells, until he had had ample time for careful observation of the natural and artificial conditions of each place and landscape and the benefit of studying good contour maps. In accordance with these views, it was determined that only absolutely necessary ways should be opened in the reservations, and that only the indispensable fire-guard chopping should be done; but

that a beginning should be forthwith made in that thorough study of the historical evolution and present state of the landscape of the reservations, upon which alone all successful endeavors to increase the effectiveness and the accessibility of that landscape must be based.

The scenery of all the reservations thus far acquired is essentially sylvan. Sylvan scenery is compounded of the shape of the ground and vegetation. The variously sculptured or modelled forms of the earth's surface furnish the solid body of landscape which man seldom finds time or strength to mar. Vegetation, on the other hand, supplies the dress of living green which man often changes, strips away or spoils, but which he can generally restore if he so chooses. Thus the study of the present landscape of the reservations naturally divides itself into two main branches, — the study of the forms of the surface of the reservations and the study of the vegetation. In both of these directions we have during the past six months made diligent researches, but it is not necessary to burden this report with a detailed recital of the facts discovered. Since the forms of topography owe their origin to geological forces, we were much pleased to receive from Professor Crosby of the Institute of Technology his notes on the geology of the regions included in the reservations. These notes will be found printed in the Appendix.

For preliminary sketch maps of the topography of the reservations we turned to an expert topographer, Mr. Gordon H. Taylor of Brookline, who as our assistant took the field in January, 1894. By making use of sun-prints of the recorded boundary plans, by measuring compass lines along the numerous wood paths and by sketching the outlines of swamps, clearings, ponds, hills and valleys, extremely serviceable maps were soon produced. The draughting of the several sheets was done in our office. Upon one sheet of tracing cloth were drawn the boundaries, the roads and paths and the lettering of the Blue Hills map for example; on another sheet were drawn the streams, ponds and swamps; and on a third the hill shading was roughly indicated by pen and pencil. Gray sun-prints obtained from the three sheets superimposed in the printing frame, when mounted on cloth, served very well for all purposes of study. Photo-lithographed in three colors, namely, black, blue and

brown, the same sheets will serve as guide maps for the use of the public and the illustration of reports.

Equipped with these maps, we have made good progress, as before remarked, in familiarizing ourselves with the "lay of the land" in the reservations. With respect to topography, the four reservations may be said to be happily distinguished by their names. Beaver Brook reservation and Stony Brook reservation are both concave troughs, drained by strong streams and bordered by more or less sharply defined ridges of ledge or gravel. Blue Hills reservation presents a chain of bold, convex masses of rock and gravel, affording wide-spread panoramic prospects in all directions. Middlesex Fells reservation, on the contrary, exhibits a plateau the surface of which is minutely broken into numerous comparatively small hills, bowls and vales.

At Beaver Brook the charm of the place springs chiefly from what lies close at hand within the bounds, — the ponds, the cascade, the rushing brook, the open pasture and the veteran oaks. At Stony Brook the glen and pond and many rocks are interesting; but the eye is often drawn away to the Blue Hills, which present themselves from various surprising and delightful points of view. At the Blue Hills themselves, while several passes and defiles are very striking and many views from hill to hill are even grand, it is the vast blue distance which tends to engross the attention, — a distance here of ocean and there of forest, and there again marked by the remote Wachusett and Monadnock, — a distance which, fortunately, is not yet disfigured by the too near approach of any town or city. Lastly, at Middlesex Fells the landscape pleases chiefly by reason of the intimate mingling of many types of scenery and objects of interest. Here is a cliff and a cascade, here a pool, pond or stream, here a surprising glimpse of a fragment of blue ocean, or again a faint blue vision of a far distant mountain.

The same hastily prepared sketch maps have in like manner assisted us in studying the present condition of the vegetation of the reservations. To the investigation of this subject in detail we early assigned Mr. Warren H. Manning of our office, and his preliminary notes will be found following Mr. Crosby's in the Appendix.

However sharply distinguishable the reservations may be



*Photography*

MIDDLESEX FELS RESERVATION.

*John J. Brown & Son*





topographically, with respect to their vegetation they are very much alike. It is true that the summits of the higher of the Blue Hills are clothed with chaparral of dwarf oak or with carpet of bearberry as are none of the other hills of the reservations. The shores of the pond at the head of Stony Brook are decked with an incomparable thicket of swamp shrubbery. The white cedar and the mountain laurel of the great swamp in the Blue Hills are not found elsewhere. The group of great oaks at Beaver Brook has no equal in all New England. On the other hand, all three of the larger reservations possess the same rock-rimmed hollows filled with water and cat-tails, the same red maple and birch swamps, the same monotonous acres of coppice oak which for generations have suffered cutting for firewood every thirty or forty years, the same occasional old pastures now overgrown by red cedar, the same rare groves of surviving white pine. Speaking generally, it is an ugly fact that the woodlands of the reservations are remarkably uninteresting as woodlands. Constant chopping and frequent fires have thoroughly discouraged the restorative forces of nature. Only on inaccessible rocks or in the depths of swamps is there any really primitive or truly natural vegetation to be seen, for it is only these places which have escaped the axe and the fires. Over the larger part of the reservations fires have almost annually destroyed the fallen leaves, and in many places even the vegetable matter of the soil itself is gone. In the Blue Hills, at the time of the taking, many hundred acres of sprout growth between five and twenty-five feet in height were standing dead from the effects of recent conflagrations, while several hundred other acres were found littered with the refuse of recent fellings.

Thus these studies have made it plain that the one important element in the landscape of the reservations which men can control, namely, the vegetation, has hitherto been grossly abused. On the other hand, the same studies have developed many facts which will have important bearings upon the course to be pursued, both by those who will direct the work of making the scenery of the reservations accessible, and by those who may have charge of the work of restoring the life and enhancing the beauty of the vegetal element in that scenery.

## SECTION 3. — WORK TO BE DONE IN THE RESERVATIONS.

It is, we believe, understood and agreed by all concerned that no work shall be done in the acquired reservations except it be directed: first, to better safeguarding the scenery of the reservations; second, to making that scenery accessible; third, to enriching or enhancing its beauty, which is its value.

For the permanent preservation of the reservations it is desirable that stone boundary marks be firmly set at frequent intervals along the boundary lines. We are informed that the necessary stones have been contracted for, and that they will be set next spring under the supervision of the newly appointed engineer to the commission.

Where the public reservations adjoin private lands it is desirable that fences be constructed on the dividing line, both in order to defend the woods of the reservations from spoliation by stray cattle, and in order to defend the private lands from trespass on the part of visitors to the reservations. Several miles of strong wire fence ought, in our opinion, to be built next spring, at a cost which need not exceed one dollar per rod. By order of the commission, Beaver Brook reservation has already been enclosed by an iron-posted and steel-barred fence. In similarly conspicuous positions and on the borders of private house grounds this will be a good fence to use, reserving the ordinary wooden-posted wire fence for concealed woodland frontages.

Since the principal destroyer of the beauty of woodlands is fire, it is desirable that every precaution be taken to prevent it from entering the reservations, to prevent it from starting in the reservations, and to prevent it from spreading should it start or enter. When the reservations were first acquired, in the winter of 1893-94, and large areas, particularly in the Blue Hills, were found strewn with falling or fallen sticks of dry, fire-killed wood, it was seen that the conditions were most favorable for the spreading of new conflagrations of the most destructive sort. The time available for work before the coming of dry and dangerous weather was not sufficient to permit the complete removal of the inflammable material, so that all that could be done was to clear of dead wood numerous long

strips of ground selected so as to connect some of the naturally fire-proof ledges or swamps. Work of this kind needs to be continued until the intervening blocks are wholly cleared of tinder.

To prevent the entrance of fire from adjacent private lands, as well as for other reasons set forth in our report for 1893, it is advisable that public roads be built along the boundary lines as soon as may be.

To hinder the spreading of fires, it is desirable not only that inflammable matter should be removed, but that a sufficient length of makeshift or temporary interior roads be made passable for such fire apparatus as may be put in service; also, that footpaths for the use of the keepers or watchmen be opened where they will be most useful; also, that telephone connections be established between the outlying parts of each reservation and headquarters, and between headquarters and the nearest public fire stations.

For checking ground fires, cans of water and "Johnson" pumps should be always in readiness, while the men employed about the reservations should be taught to use the pumps with skill. The keepers should familiarize themselves with the places where water can surely be found even in the driest weather, and the number of these places should, if possible, be increased. If ground fires can be controlled through the exercise of untiring vigilance, crown fires, or fires running through the tops of trees in the manner which has done such great damage in the past, will no more sweep the reservations, for they will have no chance to start unless they come from outside.

Besides fire, there are other destroyers of trees and woodlands for which the keepers of the reservations must be constantly on the watch. Such are the injurious insects, the most dangerous of which at the present time is the imported gypsy moth. Much of the woodland of the Fells has already been attacked by this voracious creature, which must be fought as zealously as fire, if the trees are to be saved alive. Lastly, the keepers must be watchful lest human visitors to the reservations, tempted in summer by fine sprays of bloom and in winter by evergreen leaves and bright berries, do not soon damage the beauty of some of the most charming spots.

Two special pieces of safeguarding work remain to be mentioned. When Beaver Brook reservation was acquired, the famous oaks were found to be much burdened with wounded and decaying limbs. So important are these trees, both as remarkably large specimens and as the most striking element in the scenery of their neighborhood, that we at once advised that they be surgically treated. The work of removing dead and decaying boughs, tarring the cut surfaces and cementing the worst cavities occupied six men six weeks. This unusual undertaking was well conducted by Mr. George A. Parker, under the supervision of Mr. Manning of our office. These operations naturally robbed the trees of much of the picturesqueness of old age, but the expected prolongation of the life of the grove certainly justifies this loss of pictorial interest.

In the upper part of the same reservation there lie two small mill ponds, beside one of which stood the flour mill celebrated by James Russell Lowell in the verses called "Beaver Brook." Both ponds are charming features of the local scenery. The old dams were found to be much in need of the repairs which have lately been completed. This was the second of the two special preservative works just referred to.

Coming now to the discussion of work to be done towards making the landscape of the reservations more accessible and towards enriching or enhancing its value, we have first to point out that it seems to us most advisable that these two objects should be pursued simultaneously and under one direction. Certain of the old wood paths of the Blue Hills and the Fells have during the past season, and under instructions from our office, been linked together and improved, in order to make it possible to reach the remoter quarters of the reservations without being compelled to walk miles. These roads will well serve those administrative purposes for which they have been built, they will make valuable fire guards, and the public will make use of them and will enjoy them.\* It is true, also,

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\* To enable persons who do not own horses to enjoy the new roads, we suggest that a buckboard service be established to traverse Blue Hills reservation twice daily between Readville and West Quincy during the pleasant months, passengers to be allowed to stop off at any of the different points of interest; also, that a similar service be established between Winchester and Wyoming or Malden, by way of the south end of Bear Hill and the south side of Spot Pond in the Fells reservation.





Photographer

STONY BROOK RESERVATION.

Trail Road and the Pine Hills

John Anderson's Son





that much may be done to lead many people to avail themselves of the beauty of the present scenery of the reservations by providing hitching places for horses, stands for bicycles, numerous bridle and foot paths, and plenty of sign boards to mark the way to points of interest or special vantage. The superintendents of the reservations should see to it that the work of providing these helps to visitors be done before next summer. The sketch maps already described will enable them to do this with satisfaction and despatch.

On the other hand, — and on this point we desire to speak emphatically, — such roads as have thus far been opened in the reservations are not to be considered as other than temporary affairs. Built to serve pressing administrative necessities, and generally following closely the courses of ancient wood paths, these roads do not, and cannot be made to, exhibit the scenery of the reservation as it ought to be and may be exhibited. One may easily drive through the whole length of the Blue Hills range by the present service road and come away disappointed. Contrariwise, it is easily possible to imagine a road along the range which, presenting one quiet or surprising picture after another, could not fail to awaken admiration of scenery in every observer. The reservations will not return to the community that dividend of refreshment which is rightly expected of them until roads and paths shall have been built with special reference to the exhibition of the scenery. Such roads and paths, however, cannot possibly be devised hastily or without prolonged study, not only of the ground, but of complete topographical maps. Even with map in hand, it is extremely easy to make the most unfortunate mistakes in work of this kind, as it is equally easy to go wrong in attempting to open or close vistas, or to modify vegetation for the sake of scenery.

Much work of this latter sort greatly needs to be done in the woodlands of the reservations. Excepting work directed to ponding or turning water, the selection of high or low, evergreen or deciduous, crowded or separated types of vegetation is practically the only work which can be done for the enhancement of the beauty of the landscape of the reservations. In these woodlands which have been so badly damaged, work of this kind, well handled, will be productive of remarkable and important results. In general, this work ought to be directed

to the selection and encouragement of those forms of vegetation which are characteristic of each type of topography. Sameness of treatment, regardless of site and exposure, is to be scrupulously avoided. On the windy summits of the Blue Hills the dwarf growths native to such hilltops ought to be preserved or induced to take possession. On sunny crags and ledges, pitch pine, cedar and juniper should be led to find place, while the hemlock should appear among shady rocks. At the bases of bold ledges now concealed by dull curtains of stump growth, large areas may profitably be cleared and even pastured for the sake of exhibiting the forms of the rocks and the grand distant prospects discernible between them. In other places, where only short-lived sprout-growth now exists, seedlings of long-lived trees should be encouraged to start. On slopes of poor soil permanent thickets may be advisable, while some rich glade or valley may be devoted to the development of soft turf and broad-spreading trees. There is thus no limit to the variety of sylvan types of scenery which may gradually be developed within these broad reservations.

We are prepared to immediately advise the superintendents of the reservations in certain departments of this work, should the commission decide to begin labor in this field this season. The more delicate and difficult operations of this art of enhancing the beauty of the vegetal element in landscape must, however, wait upon the building, or at least the planning, of the permanent roads and paths.\* These roads must be made to exhibit the scenery, and the vegetal scenery must be improved with reference to the roads. Thus we have double reason to regret that topographical surveys sufficiently detailed to serve as the basis for the planning of permanent roads have only lately been ordered by the commission, and that the contour maps cannot be finished before March, 1896. Not until these

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\* "The mere act of removing certain trees from a natural forest and leaving others standing is a fine art, if done with a view to beauty, although human interference, in this instance, adds nothing whatever that is tangible or material. It only adds beauty, or reveals beauty, by taking away the impediments that prevented it from being seen. Among the recognized fine arts there are two that consist *entirely* in removal. In sculpture and mezzotint no grain of marble dust or copper powder is added to the work; the artist does nothing but take away matter, at first in large quantities, and then in smaller and smaller quantities as his work approaches completion. The work of clearing in a wood is analogous to these arts when carried out with an artistic intention only."—PHILIP GILBERT HAMERTON.

maps are completed will it be possible to devise plans for the ultimate development of the scenery of the reservations and for making that scenery accessible in the most advantageous ways. Meanwhile, we recommend that the commission and the public rest content with careful guarding of the reservations from injury, a cautious beginning of the work of modifying the vegetation as instanced above, and the opening of a few temporary or makeshift roads and paths.

## PART II.—CONCERNING PROPOSED RESERVATIONS.

The report of the landscape architect to the preliminary or inquiring Metropolitan Park Commission suggested the acquisition of reservations of three principal types; namely, forest, riverside and sea-coast. For reasons stated in its first report, the permanent or executive commission determined that the first appropriation of one million dollars should be spent in buying public forests. Not content with this program, representatives of various sections of the metropolitan district obtained from the Legislature of 1894 several acts commanding the expenditure of further sums of money for the acquisition of riverside and sea-coast reservations. Accordingly, we have during the past season studied, prepared and presented plans suggesting boundaries for lands proposed to be acquired at Revere Beach and on the banks of the Charles and Upper Mystic rivers.

Concerning Revere Beach it need now only be said that the plan, as thus far outlined, contemplates the eventual abolishment of private ownership on the shore between the existing railroad and the water, the removal of the railroad to a new location, and ultimately the construction of a proper sidewalk, driveway and promenade, upon a long, sweeping curve extending the length of the beach.

Free gifts of land on the eastern shores of the Mystic ponds and on the banks of the Upper Mystic or Abbajona River in Winchester naturally led the commission to consider the acquiring of intervening and adjacent properties. The plans, as outlined, will give to the public the possession of both banks of that short reach of tidal river which lies between High Street, Medford, and the lower Mystic Pond, the eastern shore of both

ponds from the water's edge to the top of the bluff, both banks of Abbajona River from the upper pond as far up stream as Walnut Street, and the eastern bank from Walnut Street to the Winchester town hall on Pleasant Street at the foot of Mt. Vernon Street. Within or upon the borders of this long strip of public land a pleasant driveway can easily be built. The Abbajona River will need to be bridged once only. The Lowell Railroad will be crossed by the existing Bacon Street bridge.

The banks of the tidal portion of Charles River, the central waterway of the metropolitan district, were long supposed to be about to become pecuniarily valuable for industrial or commercial purposes; but as the population of the riverside lands has multiplied, and as this population has come to feel the need of agreeable open spaces, a new idea of the value of the river and the river bank has developed in the public mind with great rapidity. It was only in 1885 that the Boston Park Commission removed a row of industrial establishments for the purpose of making a public promenade on the edge of the river between Craigie and West Boston bridges. Few citizens realize in what degree the new idea of the value of the river has crystallized itself in effective action during the few years which have passed since "Charlesbank" was opened. From Craigie bridge to Watertown bridge by the course of the stream is eight miles. Out of the sixteen miles of bank bordering this tidal portion of the river the surprising length of seven miles has already been acquired by public or semi-public agencies;\* while an additional two and one-half miles, namely, the Boston bank from West Boston bridge to Cottage Farm, is dedicated in the public mind, if not in fact, to the custody of the Boston Park Commission. Only two miles of bank are occupied by practi-

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\* Below Cottage Farm the existing public banks measure approximately as follows:—

	Feet.
Charlesbank (Boston Park Commission), . . . . .	2,000
The Front (Cambridge Park Commission), . . . . .	1,300
The Esplanade (Cambridge Park Commission), . . . . .	7,000

Above Cottage Farm the present public and semi-public banks measure approximately as follows:—

	Feet.
Charles River drive (Cambridge Park Commission), . . . . .	13,000
Cambridge Hospital, . . . . .	500
Cambridge Cemetery, . . . . .	2,500
Longfellow Meadow and Soldiers' Field, . . . . .	6,000
United States Arsenal, . . . . .	4,000





*Photographed*

*John Anderson & Son*

MIDDLESEX FELS RESERVATION.

*Pickford Rock - Spot Point.*



cally irremovable industrial establishments.\* Thus it appears that there remains only about five miles of shore, concerning which it may still be asked, Shall this river bank become public or remain private property?

The argument for public ownership has been so often repeated of late and is now so generally understood and applauded that it need not be repeated here. As at Middlesex Fells the Metropolitan Commission has made a great public forest by joining together the fragmentary public holdings previously acquired by various water boards and local park commissions, so now the same commission has been commanded to connect the arsenal reservation with the public landings and river banks of Watertown on the one hand, and with the Longfellow Meadow and the Charles River drive of Cambridge on the other hand, to the end that the public riverside domain may acquire that great increase in value which arises from unity, continuity and completeness.

By direction of the commission we have accordingly given our best attention to the five miles of remaining river bank just mentioned, and have devised plans suggesting boundaries for the proposed additions to the public domain. Like the plan adopted for the Charles River road of the Cambridge Park Commission and the plan suggested for the proposed beach road at Revere, these plans of boundaries for a metropolitan reservation at Charles River are based upon the idea that a public sidewalk and roadway will eventually be built adjacent to the abutting private land. Between this roadway and the water will be a strip of land or marsh of a width which will necessarily vary in more or less exact proportion to the probable cost of the area in question. At a few points the plans are so devised as to make it possible for established coal dealers to use wharves outside the driveway. Whether the remaining open portions of the area between the driveway and the stream will remain marsh subject to tidal flooding, or become fresh water grassland usable by the public, is yet to be seen. In either event, the proposed public open space will be well worth

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	Feet.
* Boston & Albany Railroad, . . . . .	3,000
Brookline Gas Company, . . . . .	1,000
Abattoir, . . . . .	3,000
Other establishments, . . . . .	3,000

having; but if the tide can be dammed out of the river, as the late joint commission suggested, not only can the marshes of the public reservation be made usable at no great expense, but the river itself, freed from its unsightly flats and mud shores, will (also at no great cost) become a valuable and even beautiful water park. On the other hand, if the tide must continue to flow up to Watertown, flooding the marshes on its way and damming back the fresh waters, the public river banks can be made usable only by means of expensive filling, beaching or walling operations; while the resulting public domain, consisting of the river and its banks, will be decidedly less serviceable, as well as much less beautiful. Thus it may well be true that the negative saving in the cost of treating these miles of public river bank plus the positive benefit to adjacent estates and the district as a whole would pecuniarily justify the district in building the dam, even though the dam (as is quite unlikely) should make it necessary to employ continually a dredge and an ice boat in the harbor, as is done at Philadelphia and at Baltimore.

In addition to general recommendations as to the acquirement of forest, riverside and sea-coast reservations, the landscape architect to the preliminary commission called particular attention to two small but remarkable spots, the destruction of which would work great loss to the higher interests of the metropolitan district. The executive commission visited both of these places and found both of them to be as described, but nevertheless determined to spend the available metropolitan loan in rounding out the bounds of the large forest domains, and to take action towards the preservation of the Beaver Brook glen and oaks and the hemlock gorge of Charles River only in case local or private enterprise should supply at least a large part of the price of the desired lands. Fortunately for the metropolitan district and its future generations, Mr. Edwin F. Atkins of Belmont and his mother, Mrs. Elisha Atkins, came promptly forward with a gift of \$10,500 towards the cost of the acquisition of the ponds, the glen and the cascade at Beaver Brook; and this gift sufficed to cause the commission to exercise its right of eminent domain, to appropriate the additional sum required, and to assume for the public the custody of this charming spot.





*Photomicro*

BEAVER BROOK RESERVATION.

*The Brook*

*John Andrew & Son*





As a part of our professional duty towards the commission and the public, it is incumbent upon us to again call attention to the hemlock gorge of Charles River. Whether it be viewed from the high summit of the aqueduct arch, from the low level of Boylston Street bridge or from the points of ledge near the Newton mills, this passage of the river through the rocks and hemlocks presents a scene such as cannot be matched in the whole metropolitan district. Will not a few of those generous persons who are continually enriching the Boston Art Museum unite now in securing the permanent preservation of this so beautiful natural picture? With the Metropolitan Commission standing ready to assume the custody of the place, it will be worse than regrettable if another hemlock is permitted to be removed or another obtrusive building inserted.

### PART III.—CONCERNING METROPOLITAN PARKWAYS.

In addition to commanding the acquisition of reservations at Revere Beach and Charles River, the Legislature of 1894 directed the Metropolitan Park Commission to invest \$500,000 in so-called “boulevards.”

Immediately upon the passage of this act a variety of widely different schemes were proposed. It was argued that the commission should assume charge of the maintenance, watering and policing of certain selected and more or less direct or continuous existing highways, and thus preserve them as pleasure driveways exempt from the dangerous intrusion of electric cars. In other quarters it was held that the Legislature intended the appropriation to be spent for the relief of “the unemployed,” and that if only work were furnished, it did not much matter what existing highways were improved or how remote from the centre of population they might be.

In May, 1894, we were first asked to give attention to the problem presented by this new act of the Legislature. As to the place where the appropriation should be expended, it seemed to us, after due reflection, that wise economy demanded, first, that only the interior parts of the metropolitan district should be considered, because the permanent results of work done therein would benefit many persons for every single per-

son who would enjoy the results of labor expended in remoter regions; and, second, that the particular part of the interior to be selected should be determined by the generally acknowledged desirability of improved means of access to the recently acquired public forests of the Fells and the Blue Hills. Again, as to the sort of improved highway to be opened or built, it appeared to us that the public advantage would be best served, not by opening merely driveways to be enjoyed only by bicyclers and carriage owners, but by providing, in addition to roadways and sidewalks, separate passageways for the cheap, agreeable and rapid transportation of the multitude by electric cars.

Guided by these considerations, which to us seemed fundamental and governing, we studied to determine the most convenient, and at the same time practicable, routes for two such car and carriage highways, one of which should lead from the Fells and the other from the Blue Hills, towards the densely built centre of population of the district. The product of these studies may now be briefly described.

Pine Hill, Medford, and Bear's Den Hill, Malden, form the two southernmost corners of Middlesex Fells reservation. Between the two hills lies a section of Medford about a mile square, not yet much occupied by buildings because of its distance from steam and street railways. Both hills are less than five and a half miles distant from the State House.

Starting from the reservation at the bases of these hills, how far towards the heart of the metropolitan area can a convenient way for cars and carriages be opened without incurring an expense unwarrantable at the present time? The answer made by our plans is three miles, and the cityward terminus of the proposed Fells Parkway is placed, by these plans, at Broadway Park, Somerville. The proposed parkway may best be likened to a great tree. Its tangled roots are the main streets of Charlestown, East Cambridge, Cambridge and Somerville. Its trunk bridges Mystic River and extends nearly to Pleasant Street, Malden. Its main branches touch Malden and Medford, reach the Fells reservation at Bear's Den Hill and Pine Hill, and stretch along the boundary of the Fells to Winchester and through the Fells to Stoneham and Melrose. Upon reaching Broadway Park, after threading the maze of city streets,







cars and carriages will find relief and opportunity to speed away to the Fells or the northern suburbs. Incidentally, the square mile of Medford territory already mentioned will be made agreeably accessible, particularly if the electric cars should complete a circuit by following the boundary road of the Fells from Bear's Den around to Pine Hill.

Crossman's Pines, the northernmost corner of the western section of the Blue Hills reservation, is distant more than nine miles in an air line from the State House; but owing to the fact that the municipality of Boston extends four times as far south of the State House as it does north, and because Boston has undertaken the construction of a broad highway out to her uttermost boundary at Mattapan, the length of the Blue Hills parkway proposed to be acquired by the Metropolitan Commission is no greater than the length of the proposed Fells parkway already described. From Crossman's Pines to Harland Street, Milton, is about three-fourths of a mile; by Harland Street to Canton Avenue is three-fourths of a mile; and from Canton Avenue by Mattapan Street to Mattapan Square, which is the terminus of the widened Blue Hill Avenue and the proposed cityward terminus of the Blue Hills Parkway, is another mile and a half. Except in equality of length, this parkway, however, bears little resemblance to the Fells Parkway. The tree to which it may be likened has one root of great length and importance, — Blue Hill Avenue; but beyond the region covered by its trunk and branches there are found no such considerable bodies of population as lie around and beyond the Fells. For the present, therefore, this southern parkway will serve only as a means of approach to the great public domain at the Blue Hills. Its electric railroad will, however, tend to populate a large region which has hitherto been inaccessible from the city.

The accompanying skeleton map illustrates the relation of the two proposed parkways to the central parts of the metropolitan district and the regions about the two great reservations. It appears that the beginning of the widened Blue Hill Avenue at Grove Hall is a mile farther from the State House than the beginning of the proposed Fells Parkway at Broadway Park, and that Broadway Park is no farther from the centre of the metropolis than Cottage Farms bridge or Roxbury crossing.

On the other hand, either of these latter places can at the present time be reached with ease by car or carriage, while Broadway Park can be attained from inner Boston only with toil and difficulty. Somerville and Arlington, Winchester, Medford and Malden undoubtedly stand in great need of a direct and adequate avenue of approach to Boston. Charlestown is so densely built as to make the opening of a new and sufficient way impracticable. The broad territory occupied by the northern railroad companies which now extends from Rutherford Avenue almost to Somerville Avenue (a distance of three-fourths of a mile), blocks all other possible routes; while the great packing houses in the Miller's River valley, the grade crossings of the Fitchburg Railroad and the high prices of East Cambridge lands stand in the way after the railroad yards are passed.

Without giving to the study of this difficult matter more time than we can afford to give to a problem not specifically set before us, we may say that at present we believe a practicable and sufficiently suitable and well-placed passage through the difficult region would be obtained if the present location of the Lowell Railroad, between Cambridge Street, Somerville, and Charles River at Craigie bridge could be acquired and devoted, with adjacent lands, to the purpose in view. Now that the railroads use one station and own the old McLean Asylum grounds, there seems to be no good reason why the Lowell tracks should not join the Fitchburg tracks on the northern side of the ditch called Miller's River, where an East Cambridge station might still be maintained, if necessary. Such a concentration of the tracks would clear the way for an electric car and carriage avenue, which, crossing the Fitchburg Railroad above grade, would link the Charles River Basin and its public banks with one after another of the main highways of East Cambridge and Somerville, and afford the outlying cities and towns the inlet to the great city which they sorely need. From Charles River to the crossing of the Fitchburg Railroad is half a mile, from the Fitchburg Railroad to Cambridge Street, Somerville, is half a mile, and from Cambridge Street to Central Hill Park, by a line adjacent to the railroad, but well above it, another half mile. At Central Hill Park the last of the great radial highways would be tapped and the new trunk-line avenue

might end. From Central Hill Park to Broadway Park and the beginning of the proposed Fells Parkway is only a third of a mile. Thus it appears that the relief of the north-western suburbs in this particular is perhaps not quite as desperate an undertaking as it has commonly been supposed to be.

General plans of the proposed Fells and Blue Hills parkways, filed in the office of the commission, illustrate their relations to existing streets and the various subdivisions of both. The standard width proposed (one hundred and twenty feet) is simply the narrowest width within which it is safely practicable to make a separate reservation for electric cars. The roadways accompanying the car-track reservation may, of course, be increased in width, but not without a disproportionate increase in the cost of the necessary land. The use of the wider of the two roadways is proposed by us to be restricted to pleasure carriages, except for the necessary service of the houses fronting upon it.

Respectfully,

OLMSTED, OLMSTED & ELIOT.

BROOKLINE, Dec. 31, 1894.

# LIST OF PRINCIPAL MAPS AND PLANS ON FILE IN OFFICE OF OLMSTED, OLMSTED & ELIOT.

## BLUE HILLS.

Catalogue  
No.

1. Map of Blue Hills Range. Print of map made by E. G. Chamberlain, 1880-85. Scale  $\frac{1}{25,000}$ . Rec'd 8-30-1893.
2. Map showing ownership of hill lands west of Randolph Avenue (incomplete). Tracing. Scale  $1''=500'$ . Rec'd from C. E. C. Breck, 9-7-1893.
4. Map showing ownership of hill lands east of Randolph Avenue (incomplete). Tracing. Scale  $1''=500'$ . Rec'd from C. E. C. Breck, 9-7-1893.
5. Map of transit line and study for boundary east of Randolph Avenue. Print. Scale  $1''=500'$ . 10-18-1893.
6. Map of transit line and study for boundary west of Randolph Avenue. Print. Scale  $1''=500'$ . 10-18-1893.
8. Map of city of Quincy. Lith. Scale  $1''=1,000'$ . Rec'd 12-1-1893.
9. Map of township of Milton. Lith. Scale  $1''=1,000'$ . Rec'd 12-1-1893.
12. Plan of boundaries of lands to be taken west of Hillside Street. Print of tracing made for record by C. E. C. Breck. Scale  $1''=500'$ . 1-1-1894.
13. Plan of boundaries of lands to be taken between Hillside Street and Randolph Avenue. Print of tracing made for record by C. E. C. Breck. Scale  $1''=500'$ . 1-1-1894.
14. Plan of boundaries of lands to be taken between Randolph Avenue and former Milton-Braintree line. Print of tracing made for record by H. T. Whitman. Scale  $1''=500'$ . 1-1-1894.
15. Plan of boundaries of lands to be taken between former Milton-Braintree line and Willard Street. Print of tracing made for record by H. T. Whitman. Scale  $1''=500'$ . 1-1-1894.
16. Plan of boundaries of lands to be taken for Blue Hills reservation, being a compilation upon one sheet of Nos. 12, 13, 14 and 15. Tracing. Scale  $1''=500'$ . 1-9-1894.
20. Map of transit line and study of boundaries for an entranceway connecting Harland Street with Crossman's Pines. Tracing. Scale  $1''=200'$ . 2-2-1894.
21. Map of lands between Mother Brook and Neponset River. Tracing. Scale  $1''=250'$ . Compiled 2-10-1894.
22. Sketch map showing possible parkway from Arnold Arboretum by Stony Brook reservation to Blue Hills reservation. Tracing. Scale  $1''=800'$ . 2-16-1894.
23. Map of lands of Quincy Granite Company. Lith. Scale  $1''=300'$ . Rec'd 2-1-1894.
25. Map of transit line and study of boundaries for an entrance at West Street, Braintree. Tracing. Scale  $1''=200'$ . 3-8-1894.

Catalogue  
No.

26. Map of transit line and study of boundaries for an entrance at Randolph Avenue. Tracing. Scale  $1'' = 200'$ . 4-10-1894.
28. Guide map of Blue Hills reservation. Working sheet, brown paper. Scale  $1'' = 500'$ . Begun 1-1-1894.
34. Guide map of Blue Hills reservation. Three sheets. Tracings. Scale  $1'' = 500'$ . 10-1-1894.

Catalogue  
No.

## MIDDLESEX FELS.

1. Map of Middlesex Fells. Print of map made by R. B. Lawrence and I. Y. Chubbuck, 1892. Scale  $1'' = 1,250'$ . Rec'd 9-1-1893.
2. Map showing ownership of Fells lands in Malden (incomplete). Tracing. Scale  $1'' = 200'$ . Rec'd from A. F. Sargent, 9-9-1893.
8. Map showing ownership of Fells lands in Medford (incomplete). Tracing. Scale  $1'' = 200'$ . Rec'd from J. O. Goodwin, 9-13-1893.
11. Map of transit line and study of boundary between Pine Hill, Medford, and Winchester North Reservoir. Tracing. Scale  $1'' = 200'$ . Rec'd from Hodges & Harrington, 11-3-1893.
12. Map of limiting line of Fells reservation north-west of Pine Hill, defined by Act of Legislature. Tracing. Scale  $1'' = 200'$ . Rec'd from Hodges & Harrington, 11-5-1893.
14. Map of limiting line of Fells reservation east of Pine Hill, defined by Act of Legislature. Tracing. Scale  $1'' = 200'$ . Rec'd from Hodges & Harrington, 11-9-1893.
15. Plan of boundaries of lands to be taken west of Forest Street, Medford, and Main Street, Stoneham. Print of tracing made for record by Hodges & Harrington. Scale  $1'' = 500'$ . 2-1-1894.
16. Plan of boundaries of lands to be taken between Spot Pond and adjacent streets. Print of tracing made for record by Hodges & Harrington. Scale  $1'' = 500'$ . 2-1-1894.
17. Plan of boundaries of lands to be taken east of Pond Street, Woodland Road and Highland Avenue. Print of tracing made for record by A. F. Sargent. Scale  $1'' = 500'$ . 2-15-1894.
18. Plan of boundaries of lands to be taken for Fells reservation, being a compilation upon one sheet of Nos. 15, 16 and 17. Tracing. Scale  $1'' = 500'$ . 2-16-1894.
20. Map of township of Winchester. Lith. Scale  $1'' = 600'$ . Rec'd 4-1-1894.
21. Map of township of Melrose. Lith. Scale  $1'' = 450'$ . Rec'd 4-1-1894.
22. Guide map of Fells reservation. Working sheet, brown paper. Scale  $1'' = 500'$ . Begun 5-1-1894.
25. Plan of relocation of boundary line over land of A. L. Wyman, Winchester. Tracing. Scale  $1'' = 500'$ . Rec'd from C. D. Elliott, 7-28-1894.
29. Topographical map of site of middle dam, South Winchester Reservoir. Tracing.  $1'' = 20'$ . Rec'd 10-2-1894.
- 29A. Plan for widening middle dam, South Winchester Reservoir. Tracing.  $1'' = 20'$ . 10-3-1894.



Catalogue  
No.

30. Guide map of Fells reservation. Three sheets. Tracings. Scale  $1'' = 500'$ . 12-1-1894.
32. Map showing ownership of lands south of legislative line, Medford, with suggestion for boundary line. Tracing. Scale  $1'' = 200'$ . 11-8-1894.
33. Topographical map of south boundary of reservation between Bear's Den Entrance and Highland Avenue. Tracing. Scale  $1'' = 40'$ . Rec'd from W. T. Pierce, 7-20-1894.
34. Topographical map of proposed south boundary of reservation between Highland Avenue and Elm Street. Tracing. Scale  $1'' = 40'$ . Rec'd from W. T. Pierce, 7-22-1894.
35. Topographical map (additional) of proposed south boundary between Highland Avenue and Fulton Street. Tracing. Scale  $1'' = 40'$ . Rec'd from W. T. Pierce, 7-22-1894.
37. Plan of boundary road between Bear's Den Entrance and Highland Avenue. Tracing. Scale  $1'' = 40'$ . 9-7-1894.
39. Plan of boundary road between Highland Avenue and Forest Street. Tracing. Scale  $1'' = 40'$ . 10-6-1894.
40. Plan of boundary road along Forest Street, Medford. Tracing. Scale  $1'' = 40'$ . 10-6-1894.
41. Plan of boundaries of lands to be taken between Bear's Den Entrance and Highland Avenue. Print of tracing made for record by W. T. Pierce. Scale  $1'' = 40'$ . 9-19-1894.

Catalogue  
No.

## STONY BROOK.

1. Map of lands between Bellevue Hill and Hyde Park, showing ownership and contours ten feet apart. Tracing. Scale  $1'' = 500'$ . Rec'd from G. L. Richardson, 10-18-1893.
4. Map of transit lines and study of boundaries. Five sheets. Tracing. Scale  $1'' = 200'$ . 11-23-1893.
14. Plan of boundaries of lands to be taken on Bellevue Hill. Print of tracing made for record. Scale  $1'' = 100'$ . 4-30-1894.
15. Plan of boundaries of lands to be taken in Boston south of Washington Street. Print of tracing made for record. Scale  $1'' = 500'$ . 4-30-1894.
16. Plan of boundaries of lands to be taken in Hyde Park. Print of tracing made for record. Scale  $1'' = 500'$ . 4-30-1894.
17. Plan of boundaries of lands to be taken in Boston south of Washington Street. Print of tracing made for record. Scale  $1'' = 500'$ . 8-24-1894.
18. Plan of boundaries of lands to be taken in Hyde Park. Print of tracing made for record. Scale  $1'' = 500'$ . 8-24-1894.
19. Guide map of Stony Brook reservation. Working sheet, brown paper. Scale  $1'' = 500'$ . Begun 6-1-1894.
20. Topographical map of route of proposed parkway between Arnold Arboretum and Stony Brook reservation. Tracing. Scale  $1'' = 100'$ . Rec'd from Boston Engineering Department, 11-3-1893.

Catalogue  
No.

24. Topographical map of Bellevue Hill. Tracing. Scale  $1'' = 100'$ . Rec'd from Boston Engineering Department, 3-1-1894.
- 25-31. Studies of boundaries of lands to be taken for parkway between Washington Street and Weld Street. Tracings. Scale  $1'' = 100'$ .
32. Guide map of Stony Brook reservation. Three sheets. Tracings. Scale  $1'' = 500'$ . 8-1-1894.
33. Topographical map of proposed route for parkway between River Street, Hyde Park, at Stony Brook reservation, and Canton Avenue, Milton, at Blue Hills reservation. Tracing. Scale  $1'' = 500'$ . Rec'd from G. L. Richardson, 10-9-1894.
35. Plan of boundary of lands to be taken for parkway between Washington Street and Anawan Avenue, Boston. Print of tracing made for record by engineers of Board of Survey. Scale  $1'' = 150'$ . 11-27-1894.
36. Plan of boundary of lands to be taken for parkway between Anawan Avenue and Weld Street, Boston. Print of tracing made for record by Boston Engineering Department. Scale  $1'' = 150'$ . 11-27-1894.

Catalogue  
No.

## BEAVER BROOK.

1. Map of Ward estate, south of Trapelo Road, Waltham. Tracing. Scale  $1'' = 40'$ . Rec'd from W. T. Pierce, 10-1-1893.
2. Map of lands between Trapelo Road and Boston & Maine Railroad, with a study for boundary of proposed reservation. Tracing. Scale  $1'' = 100'$ . 10-18-1893.
3. Map of lands north of Trapelo Road, with a study for boundary of proposed reservation. Tracing. Scale  $1'' = 100'$ . 11-1-1893.
6. Plan of boundaries of lands to be taken for Beaver Brook reservation, being a compilation upon one sheet of Nos. 2 and 3. Tracing. Scale  $1'' = 100'$ . 3-29-1894.
7. Topographical map of Beaver Brook reservation. Tracing. Scale  $1'' = 40'$ . Contour interval  $\frac{1}{2}$  feet. Rec'd from W. T. Pierce, 9-13-1894.
13. Plan of lines and grades for Trapelo Road, North Street and Mill Street. Tracing. Scale  $1'' = 40'$ . 10-8-1894.
14. Profiles to accompany No. 13. Tracing. 10-9-1894.

Catalogue  
No.

## REVERE BEACH.

1. Map of railroad location between Beachmont and Saugus River. Tracing. Scale  $1'' = 200'$ . Rec'd 11-14-1893.
- 2-5. Studies for boundaries of lands to be taken. Tracing. Scale  $1'' = 200'$ . 12-26-1893.
6. Preliminary plan of drive and promenade, with typical cross-sections. Tracing. Scale  $1'' = 200'$ . 12-28-1893.
10. Map of shore lands between Beachmont and Lynn. Two sheets. Tracings. Scale  $1'' = 200'$ . Rec'd from J. N. McClintock, 10-9-1894.

Catalogue  
No.

11. Map of lands between Beachmont and Revere Railroad station. Tracing. Scale  $1''=200'$ . Rec'd from J. N. McClintock, 10-9-1894.
12. Map of lands between Revere Railroad station and Everett Railroad station. Tracing. Scale  $1''=200'$ . Rec'd from city engineer of Chelsea, 10-9-1894.
13. Map of shore lands between Beachmont and Winthrop Great Head. Tracing. Scale  $1''=200'$ . Rec'd from H. T. Whitman, 10-19-1894.
14. Preliminary plan for drive and promenade, Beachmont to Winthrop Great Head. Tracing. Scale  $1''=200'$ . 11-5-1894.

## CHARLES RIVER.

Catalogue  
No.

1. Sketch plan of existing and proposed public reservations on banks of Charles River between Waltham line and Craigie bridge. Tracing made to illustrate report of joint commission, March, 1894. Scale  $1''=400'$ .
2. Sketch map of Charles River from Waltham line to Dedham and Hyde Park. Tracing. Scale  $1''=1,200'$ . Compiled 6-19-1894.
3. Sketch map showing existing public reservations on banks of Charles River. Tracing. Scale  $\frac{1}{30,000}$ . Compiled 1-1-1894.
4. Map showing ownership of lands on banks of river between Galen Street and Western Avenue. Tracing. Scale  $1''=200'$ . Rec'd from Nash & Hunter, 9-9-1894.
5. Map showing ownership of lands on banks of river between Western Avenue and North Harvard Street. Tracing. Scale  $1''=200'$ . Rec'd from Nash & Hunter, 9-9-1894.
6. Map showing ownership of lands on south bank of river between North Harvard Street and Cambridge Street. Tracing. Scale  $1''=200'$ . Rec'd from Nash & Hunter, 10-25-1894.
7. Plan showing alternative studies for boundaries of lands to be taken between Galen Street and Western Avenue. Print. Scale  $1''=200'$ . 11-1-1894.
8. Plan showing alternative studies for boundaries of lands to be taken between Western Avenue and North Harvard Street. Print. Scale  $1''=200'$ . 11-1-1894.
9. Plan showing alternative studies for boundaries of lands to be taken between North Harvard Street and Cambridge Street. Print. Scale  $1''=200'$ . 11-1-1894.

## MYSTIC RIVER.

Catalogue  
No.

1. Map of lands between Pleasant Street, Winchester, and Mystic water works pumping station. Tracing. Scale  $1''=200'$ . Rec'd from C. D. Elliot, 10-15-1894.
2. Plan of lands proposed to be taken between Pleasant Street, Winchester, and High Street, Medford. Scale  $1''=200'$ . 11-3-1894.

## BLUE HILLS PARKWAY.

Catalogue  
No.

1. Map of route of proposed parkway along Mattapan and Harland streets, Milton, between Mattapan Square and Blue Hills reservation. Tracing. Scale  $1'' = 500'$ . Rec'd from C. E. C. Breck, 4-14-1894.
2. Map showing ownership of lands along Mattapan Street between Mattapan Square and Canton Avenue. Tracing. Scale  $1'' = 200'$ . Rec'd from F. S. Foster, 9-11-1894.
3. Plan for proposed parkway between Mattapan Square and Canton Avenue. Tracing. Scale  $1'' = 200'$ . 8-30-1894.
4. Alternative plan for portion of proposed parkway between Mattapan Square and Brook Road. Tracing. Scale  $1'' = 200'$ . 8-30-1894.

## FELLS PARKWAY.

Catalogue  
No.

- 1-2. Map of northern part of metropolitan district, with suggestion of a route for a parkway between Somerville, Fells reservation and Lynn woods. Print. Scale  $1'' = \frac{1}{2}$  mile. 5-18-1894.
3. Map of streets and lands between Broadway, Somerville, and Savin Street, Malden. Tracing. Scale  $1'' = 200'$ . Rec'd from A. F. Sargent, 5-16-1894.
6. Preliminary plan for parkway between Mystic River and Pleasant Street, Malden. Tracing. Scale  $1'' = 200'$ . 5-23-1894.
7. Alternative preliminary plan for parkway between Mystic River and Pleasant Street, Malden. Tracing. Scale  $1'' = 200'$ . 5-23-1894.
9. Preliminary plan for parkway between Pleasant Street and Savin Street, Malden. Tracing. Scale  $1'' = 40'$ . 6-21-1894.
11. Topographical map of proposed route of parkway between Valley Street and Fells reservation, Medford. Tracing. Scale  $1'' = 40'$ . Rec'd from W. T. Pierce, 6-22-1894.
15. Map of streets and lands along Valley Street between Salem Street and Forest Street, Medford. Tracing. Scale  $1'' = 200'$ . Rec'd from A. F. Sargent, 7-14-1894.
18. Preliminary plan for parkway along Valley Street between Salem and Fulton streets, Medford. Tracing. Scale  $1'' = 200'$ . 7-19-1894.
19. Topographical map of proposed route of parkway between Savin Street and Fells reservation, Malden. Tracing. Scale  $1'' = 40'$ . Rec'd from W. T. Pierce, 7-20-1894.
24. Plan for parkway between Broadway, Somerville, and Highland Avenue, Medford. Scale  $1'' = 200'$ . 7-25-1894.
25. Alternative plan for parkway between Broadway, Somerville, and Highland Avenue, Medford. Scale  $1'' = 200'$ . 7-26-1894.
26. General plan showing circuit made by proposed parkways in Medford and Malden. Tracing. Scale  $1'' = 200'$ . 7-26-1894.
31. Revised plan for parkway between Pleasant Street and Savin Street, Malden. Tracing. Scale  $1'' = 40'$ . 8-6-1894.
32. Preliminary plan for parkway between Valley Street and Fells reservation, Medford. Tracing. Scale  $1'' = 40'$ . 8-6-1894.
33. Preliminary plan for parkway between Savin Street and Fells reservation, Malden. Tracing. Scale  $1'' = 40'$ . 8-6-1894.





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## APPENDIX.

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## NOTES ON THE GEOLOGY OF THE RESERVATIONS.

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TO MESSRS. OLMSTED, OLMSTED & ELIOT, *Brookline, Mass.*

DEAR SIRs :— Enclosed please find such notes as I have found time to make upon the geology of the new public reservations.

Yours truly,

WM. O. CROSBY.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Jan. 1, 1895.

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### A.—BLUE HILLS RESERVATION.

The Blue Hill range is a well-defined tract of semi-mountainous character which rises rather abruptly from the broad meadows of the Neponset on the west to its maximum elevation in Great Blue Hill, and then gradually declines and broadens eastward until it reaches the sea in Quincy and Braintree. Geologically it is a complex of granitic rocks (granite and felsite) and the Cambrian slates, the most ancient rocks of this region; and both geologically and topographically it is a solid wall of the older formations, interrupting the continuity of the great series of conglomerates, sandstones and slates constituting the Carboniferous formation of eastern Massachusetts, forming thus the common boundary of the broad Carboniferous area known as the Boston basin on the north and the narrower Norfolk basin on the south.

The Blue Hill range is of exceptional importance to students of our local geology, since it is virtually a key to the geological structure of the entire region, and the study of any other equal area could be more safely neglected than of this. Again, although the maximum elevation is only six hundred and thirty-five feet, the Blue Hills are the most prominent topographic feature and the noblest erosion monument, not only of eastern Massachusetts, but, considering their proximity to the coast, of the entire Atlantic sea-board of the United States south of New Hampshire.

The slates involved with the granite in the Blue Hill complex are known to be chiefly of middle Cambrian age by the trilobites (*Paradoxides harlani*) and other fossils found in the celebrated trilobite quarry on the south bank of Hayward's Creek in Braintree. It is very probable, however, that the slate belongs in part also to the lower Cambrian. No recognizable trace of the floor or foundation upon which these Cambrian strata were deposited has been discovered in the Blue Hill area. But the most satisfactory conclusion appears to be that where the Blue Hills now stand was an off-shore area in the Cambrian sea; and in this deep and quiet water, fine silt or mud, which by hardening formed our Cambrian slates, was slowly deposited to a vast thickness. These strata were then strongly folded and mashed up by the horizontal compressive strains in the earth's crust, and thus elevated above sea level; and, so far as we have any certain evidence, this region remained dry land during the long Ordovician, Silurian and Devonian ages, or until the beginning of Carboniferous time.

During this period and probably early in the Devonian age the eruption of the granitic rocks occurred. The molten granite magma slowly ate and forced its way upwards to and into the deeply folded Cambrian sediments; and eventually the weakened strata yielded to the disrupting forces, and large volumes of molten rock were poured out at the surface, forming extensive sheets and cones of lava. Much of this lava was at first of a glassy or vitreous character (obsidian), but subsequent devitrification of the glass has changed it to felsite. To a limited extent, also, the felsite occurs in the form of irregular dikes cutting through the granite.

One of the most important facts in the geological structure of the Blue Hills is found in the occurrence of two distinct types of felsite and their widely different relations to the granite. At the time of its eruption the granite must have been deeply buried beneath the Cambrian slates, in which it formed large dome-shaped masses or batholiths; and the most abundant and characteristic type of felsite occurs chiefly or exclusively as a contact-zone between the granite and the slate. The felsite occurring in this way is a highly crystalline quartz porphyry, which passes downward by an insensible gradation into the granite. In walking over the main range of the Blue Hills, from the Great Blue Hill to Rattlesnake Hill and Pine Hill, we find that this quartz porphyry is the prevailing and almost the only surface rock; and one easily reaches the conclusion that the hills are chiefly composed of it. But on closer examination we observe that wherever erosion has cut most deeply on the flanks or summits of the hills the granite is exposed beneath, with a perfect gradation, as already noted, between the two rocks. The important conclusion is thus forced.

upon us that the beautifully rounded and graceful contours of the hills are not due primarily to erosion, but they reveal, rather, the original forms of the granite batholites. That is, each hill is a dome-shaped batholite of granite, with a ventering or outer layer of intensely hard and resistant quartz porphyry. These batholites were originally deeply buried beneath the Cambrian slates. By the erosion of the relatively soft and yielding slates the batholites were long since exposed; but the firm and flinty outer layer of quartz porphyry is being worn away with such extreme slowness that the original forms of the batholites are still, in a large degree, intact. This simple fact accounts not only for the forms but also for the exceptional elevation of the summits of the main range; for where the quartz porphyry has been finally worn away, the granite, yielding, on account of its more granular texture, much more rapidly to the agents of erosion, — water and frost, — has in general lost its original contours, and presents reliefs of only moderate elevation, such as we observe along the northern border of the Blue Hills and in the quarry district of West Quincy.

During the formation of the batholites, and while the interior portions were still in a molten condition, fissures were, in some instances, formed in the outer shells, through which, as previously stated, considerable volumes of the molten rock were extruded, forming by rapid cooling and subsequent devitrification dikes and sheets of compact and banded felsite. This type of felsite, which is also a hard, flinty rock, is found chiefly in the district east of Randolph Avenue, the largest body of it extending from the vicinity of Wampatuck Hill along the south side of Rattlesnake Hill to the eastern base of Pine Hill. The compact and greenish felsite which flowed from this great fissure now covers much of the country to the southward, toward Great Pond in Braintree.

The slate in the Blue Hill complex, on account of its soft and yielding character, occurs chiefly in the valleys and lowlands, its aggregate area being very much less than that of the granite and felsites; and when we consider that it must once have covered the entire district, the enormous waste which it has suffered becomes apparent. The normal topographic relations of the granite and slate are well shown in the valleys of Monatiquot River, Hayward's Creek and Ruggles Creek, in Braintree and Quincy; and they are very clearly exhibited in the central portion of the Blue Hills, where the main range is separated from the much lower northern range by the broad drift-covered interval crossed by Randolph Avenue and Harland Street, and drained by Pine Tree Brook. The axis of this depression is marked by a belt of slate extending its entire length, from a mile east of Randolph Avenue to a point half a mile west of Harland Street.



With the advent of the Carboniferous age this region was invaded by the sea, and a great series of conglomerate beds, belonging to the millstone grit epoch, and aggregating a thousand feet or more in thickness, was spread far and wide over eastern Massachusetts, covering the site of the Blue Hills, which, although outlined geologically in the batholites of granite, had as yet no topographic existence. During a considerable part of this period the area now known as the Boston basin was the scene of intense volcanic activity, and immense beds of lava were interstratified with the beds of conglomerate. The igneous action was, however, very definitely localized, for on the south side of the Blue Hills the lava beds are wholly wanting. The marked oscillations of this part of the earth's crust and the resulting powerful erosive action, essential to the formation of the conglomerate series, eventually gave way to more stable and quiet conditions, during the prevalence of which the beds of the coal measures were deposited. South of the Blue Hills area extensive marshes were established, over which, through the agency of a luxuriant flora, were formed the coal beds of southern Massachusetts and Rhode Island; but north of where the Blue Hills now stand, in the Boston basin area, the dying out of the volcanic fires was followed by a pronounced subsidence of the sea bottom, which prevented the formation of the coal marshes here, permitting instead the deposition of a great thickness (one thousand feet, at least) of fine silt, which now forms the newer slates of the Boston basin, overlying the conglomerate series. Thus a second time in this prenatal period the Blue Hills formed an important geological boundary.

These quiet conditions — deep estuary on the north and marine flats and marshes on the south — could not last forever. The subterranean forces were slowly gathering strength, and the Carboniferous age finally terminated in the Appalachian revolution, during which the strata were strongly folded and faulted, and elevated above the sea level to form lofty mountain ridges. Along what are now the northern and southern borders of the Boston basin two gigantic faults were formed, the sedimentary rocks first settling down some thousands of feet between the massive walls of granite, and being then mashed up, as in a vise, through the approach of these walls, forming the remarkable series of arches to be noted in a north-south section of the Boston basin. The most southerly of these two great faults defines the northern border of the Blue Hills. Four to five miles south of this is a similar and approximately parallel fault, marking the southern boundary of the orographic block out of which the Blue Hills as we know them have been carved. The granite foundations on which the Carboniferous strata rested were here too rigid to admit of complex flexing; but the powerful earth movements first isolated this

block by profound fractures, and then tilted it, the northern edge being elevated and the southern edge depressed, developing thus a mountain range of monoclinical structure, and composed from the base upward of (1) the batholites of granite with their covering of felsite; (2) an unknown thickness of the strongly folded Cambrian slates; and (3) at least two thousand feet and probably more of Carboniferous strata, with a marked southerly dip, due to the tilting of the block. The Appalachian revolution was attended or closely followed, in the Boston basin, by another period of igneous activity, during which the numerous dikes and intrusive sheets of diabase (trap) were formed. But these are not a prominent feature in the geology of the Blue Hills, and, becoming fewer southward, they are almost unknown in the Norfolk basin.

Structurally, the Blue Hills were now complete. The block out of which they were to be carved by the agents of erosion presented a lofty fault scarp toward the Boston basin and sloped more gently down beneath the Norfolk basin. We thus learn that, prominent as the Blue Hills are in the modern landscape, they possess scarcely a tithe of their original mass and height; for we have only to restore, in imagination, the structure still plainly indicated in the surviving remnants of the various formations, to discover that even the summit on which the observatory now stands was once buried thousands of feet, if not actually miles, deep in the very heart of the vanished mountain.

So far as any facts remain to guide us to a definite conclusion, this region was above sea level and suffering erosion during the long Mesozoic and Cenozoic eras from the Appalachian revolution to the close of the glacial period. The original constructive reliefs have given place to the destructive reliefs of ordinary mountains; and the latter, through successive base-levellings, to the moderately diversified lowlands of to-day. The crest line of the Blue Hills was at first the brink of the great northern fault scarp; and, although it may have shifted during the wearing away of the Carboniferous strata, it must have returned to this position when the felsite was finally first laid bare. The felsite, however, is not only more resistant than the sedimentary rocks, but it is more enduring, also, than the underlying granite. Hence we may conclude that, since the time when erosion first uncovered the felsite, its elevated northern edge has formed the crest of the Blue Hill range. In other words, during the gradual wearing away of the felsite this crest-line has migrated southward.

When the recession of the northern edge of the felsite had uncovered the Pine Tree Brook band of Cambrian slate, the more rapid erosion of the latter rock gradually developed the depression or interval separating the elevated felsite range on the south and the

lower granite range on the north. The facts indicate that the original fault block was not only tilted to the southward but to the eastward as well, the north-west corner thus becoming the highest point. Hence, in its geological relations Great Blue Hill is comparable with Mt. St. Elias, which Russell has shown to be the high corner of a tilted orographic block. We also find in this original tilting an explanation of the east-northeasterly trend of the Blue Hill ranges.

The closing episode in the history of the Blue Hills was the glacial period. On account of the intense hardness of the granite and felsite their contours are due only to a very limited extent to the erosive action of the great ice sheet; and the chief effect of glaciation is to be seen in the numerous swampy tracts, which are simply areas of obstructed drainage resulting from the irregular distribution of the drift. A few more or less typical drumlins are found in the Blue Hill area, principally north of the main range; but they are quite subordinate to the rock hills, and might easily escape recognition in a general or rapid survey of the district.

Modified drift (stratified sand and gravel) is abundantly and typically developed along the northern border of the hills, and again along the southern border, in the valley of Blue Hill River; but within the hills it is generally wanting. The beautiful Hoosiewhissick Pond occupies a large kettle-hole in the sand plain, and owes its round-about connection with the Blue Hill River to the seemingly fortuitous contours of the plain.

#### B. — STONY BROOK RESERVATION.

Great Blue Hill is not only the highest point in the southern rim of the Boston basin, but, on account of its position at the west end of the range, it defines with considerable accuracy the south-west corner of the basin, as Prospect Hill in Waltham does the north-west corner. Looking northward from Great Blue across the valley of the Neponset, we have distinctly and compactly outlined the elevated, wooded tract which embraces the Stony Brook reservation, crowned by Bellevue Hill, which rises three hundred and forty-seven feet above tide, and is distinctly the highest point within the Boston basin. Bellevue Hill proper, however, is a magnificent drumlin, and rises probably a full hundred feet above its rock foundation. Still, it marks with approximate accuracy the highest point reached by the solid rocks in this reservation.

The Blue Hills, as we have seen, are a composite ridge which has been thrust up between the Boston and Norfolk basins, and from which the formerly overlying Cambrian and Carboniferous strata have been very completely denuded, exposing the core or axis of crystalline rocks (granite and felsite). In other words, in its general relations

to the two basins the Blue Hill Range is an anticline. The Neponset valley is a very complex syncline, — a geologic as well as a topographic trough. Two or three miles farther north, and clearly marked by a broad band of slate, is another syncline of simpler structure, which extends from the valley of the Charles, through West Roxbury to Roslindale and Mt. Hope, and thence eastward across Dorchester to Dorchester Bay. From the unsymmetrical anticline separating these two synclines the great slate formation has been entirely worn away; and the underlying conglomerate series, with its interstratified beds of lava, at least a thousand feet in thickness, has suffered such enormous waste that the crystalline axis of the fold has been exposed for nearly half its length.

In Dedham we have a large area of granite, diorite and felsite, forming part of the western border of the Boston basin. These rocks, together with the Cambrian strata, formed throughout this region the foundation or floor upon which the Carboniferous conglomerate and slate were deposited. During the Appalachian revolution, as we have seen, these strata were powerfully compressed in a north-south direction, and thrown into a series of east-west folds. At the same time the more rigid crystalline floor of the basin was warped and broken, elevated along the anticlines and depressed along the synclines. And so it happens that the wearing away of the convex or anticlinal arches of the strata exposes the foundation rocks, especially near the western margin of the basin, where they attain their greatest elevation above the sea. This will explain the tapering ridge of granite and felsite which extends eastward from the Charles River in Dedham across West Roxbury and Hyde Park into Dorchester. This ridge is deeply and broadly divided by the north-south valley occupied by the Boston & Providence Railroad; and the western half, forming one compact area of high and more or less rugged ground nearly two miles square, is completely isolated by well-defined valleys and girdled by the railroad. Almost in the exact centre of this area, and directly south of Bellevue Hill, is Turtle Pond, from which Stony Brook flows south and south-east through as perfect a wilderness as exists anywhere in the metropolitan district; and the reservation may be briefly defined as the valley of Stony Brook from its farthest source on Bellevue Hill to Hyde Park village. The topographic details are very complex. With the exception of Bellevue Hill, the greater part of the surface is a maze of abrupt and massive ledges of granite and felsite, divided and isolated by narrow defiles and an intricate system of swamps. In a more general view, however, we note a marked simplicity of outline, which, as will be seen, accords well with the geological structure. Dominant rock hills, such as characterize the main range of the Blue Hills, are wholly wanting; and the summits



of the majority of the ledges can be referred to an approximately plane surface, which attains its maximum elevation in the vicinity of Bellevue Hill and slopes gently southward toward the Neponset and Mother Brook.

Within the reservation the rocks are, as in the Blue Hill reservation, almost wholly granite and felsite, and their general relations are similar. In the vicinity of Bellevue Hill and Washington Street, and about Turtle Pond, granite prevails. It is often fine grained, and encloses occasional patches and dikes of felsite. But south of the pond felsite is the prevailing rock. It probably forms a great sheet covering the granite, save where it has been removed by erosion; and the most probable view of the geological structure of this broadly and deeply denuded anticline is that it embraces but one great batholite of granite with its cover of felsite. This exists now as a tilted orographic block, elevated along its northern and depressed along its southern margin, like the orographic block of the Blue Hills. This explains how it is that, as in the Blue Hills, erosion has removed the cover of felsite from the granite to the northward, while it is still almost intact to the southward. Along the southern border of the reservation the felsite passes, just as in the Blue Hills, beneath the Carboniferous conglomerate, which occupies the Neponset valley. The conglomerate forms some very bold and picturesque ledges overlooking the lowlands, especially west of the main valley of Stony Brook.

It is very evident that these hard rocks have once been base-levelled, or worn down by the agents of erosion to an approximately plane surface. This peneplain was then elevated several hundred feet, renewing the erosive energy of running water; and the later cycle of topographic development is now well advanced. Turtle Pond has a height of one hundred and thirty feet above the sea, while the rocky hills rising abruptly around this basin have heights ranging from a little less than two hundred feet in the Perch and other lesser hills to two hundred and twenty feet in Overbrook Hill, two hundred and forty-four feet in Milkweed Hill and two hundred and fifty-six feet in Bearberry Hill. But the profiles of this valley indicate that if the drift were cleared from its bottom we should find that Stony Brook has here sunk its channel in the solid rocks to a maximum depth of at least one hundred and fifty feet below the original surface of the peneplain as represented by the summits just referred to; and the tributary valleys, ramifying in every direction, have subdivided the peneplain until such isolated remnants are all that remain of it. We have in the peneplain out of which they have been carved, however, a satisfactory explanation of the general uniformity in the heights of the rocky hills.



As in the Blue Hills, the chief result of glaciation was obstructive rather than destructive. The great ice-sheet had little power to abrade or wear away these rocks of almost adamantine hardness below the depth to which they had been decomposed or softened by the quiet and unobtrusive atmospheric influences in preglacial times. But it scraped a large amount of detritus (drift) into the valleys, obstructing, diverting, and in some instances, apparently, actually reversing, the drainage. We have here the cause and the chief geological interest of the numerous swamps; and it would be a pretty study, with a good topographic map in hand, to trace out the preglacial drainage lines. The narrow gorge of Stony Brook along the eastern base of Overbrook Hill is a plain enough indication that this is not its pre-glacial course; and the original channel is undoubtedly concealed beneath the drift somewhere to the eastward of the present channel. This drift barrier, which turned the waters of Stony Brook through one of its tributary glens, is a sufficient explanation of Turtle Pond, with its swampy margins. Several of the swamps have two outlets in a state of equilibrium, discharging water simultaneously in opposite directions. It is obvious, of course, in such cases, that in part, at least, the drainage has been diverted. The diversion is proved in some cases, also, by the very roundabout courses which the water is forced to follow.

Nothing in the surface geology of this area is of greater interest, however, than the fact that Stony Brook, flowing from its source near Bellevue Hill directly toward Mother Brook and the Neponset, until within less than half a mile of the former, turns abruptly in the swamp from which Bold Knob rises, and finally becomes a tributary of the distant Charles. It can hardly be doubted that this head-water portion of Stony Brook was a preglacial tributary of Mother Brook, and through that of the Neponset; and a very low drift barrier is, apparently, all that prevents its waters from following that course to-day.

The ice-sheet also molded some of the drift of this area into drumlins. Bellevue Hill is the most important of these, and the only well-developed drumlin actually within the limits of the reservation. Monterey Hill is a fine large drumlin east of the reservation; and south of the reservation, in the valley of Mother Brook, there are several small drumlins. Two of these, on the west side of Happy Valley, are very perfect in form and only slightly coalescing; while on the east side of the valley three drumlins are more completely merged in one continuous mass, extending east to Glenwood Street. There are no important deposits of modified drift within the reservation; but these drumlins on the southern margin are bordered and partially enveloped by a quite typical sand plain with kettleholes.

## C. — MIDDLESEX FELS RESERVATION.

On the northern rim of the Boston basin, midway of its length, between the deep valleys of the Malden River on the east and the Mystic on the west, lies the elevated and broken wilderness known as the Middlesex Fells. Topographically this area is comparable with the Stony Brook reservation, being a southward-sloping and dissected portion of the same great peneplain, which borders the Boston basin on every landward side and embraces a large part of eastern Massachusetts. There are, however, in the broader Fells reservation two well-marked north-south valleys. The eastern valley is marked by Spot Pond, Wright's Pond and Intervale Brook, and the western by the Winchester reservoirs and Bowery Brook. These are distinctly upland valleys, or natural reservoirs. Spot Pond, which supplies three populous municipalities with water, has an elevation of one hundred and forty-eight feet; and the Winchester reservoirs, occupying the site of former swamps, are a little higher. Both of these valleys are naturally tributary southward to the tidal portion of the Mystic; although Spot Pond, in consequence of a slight drift barrier at its southern end, has, during post-glacial times, discharged its water over its eastern rim into the Malden River. The ridge separating these two valleys includes Pine Hill (two hundred and forty feet), Silver Mine Hill and Winthrop Hill, and culminates northward in Bear Hill (three hundred and twenty feet), which is the highest point in the reservation. The largest area of continuously high land is found, however, in the south-eastern part of the Fells, between Spot Pond, Melrose and Malden. This is a singularly well-preserved portion of the original peneplain, an area of nearly a square mile rising above the two hundred feet contour, and culminating in Cairn Hill, three hundred feet high.

Geologically this reservation is extremely diversified, both as regards the variety of the rocks and the complexity of their relations. The oldest rocks are the quartzites and metamorphic slates, presumably of Cambrian age. These ancient strata, which were once layers of sand and mud on the bed of the ocean, are very intimately associated, many ledges showing frequent alternations of quartzite and slate; and the quartzites are often slaty and the slates quartzose or siliceous. They have their largest development in the area north-east of Spot Pond, between the Ravine Road and Franklin Street, and extend with diminished breadth south-westerly across the basins of Spot Pond and the South Winchester reservoir. Near the south-west corner of Spot Pond the continuity of the belt is nearly interrupted by the encroachment of the granite rocks. South-west of this point quartzite prevails, and there is but little true slate; but to the north-

east the strata are of a much more slaty character. It is evident that in differential erosion, the sedimentary rocks yielding more readily than the enclosing granitic rocks, we have a simple and sufficient explanation of the existence and the marked northeast-south-west trends of the basins of Spot Pond and the south reservoir, and the fact that they are not connected. The prevailing dip of the strata is north-west at high angles, and at many points the beds are nearly vertical.

Besides this main belt of sedimentary rocks, occasional isolated masses of slate and quartzite are found in the igneous rocks, both north and south. The most interesting of these occurrences lies just outside the reservation, between Bear Hill and Marble Street, in Stoneham. A bed of highly metamorphic slate with the usual north-westerly dip is here closely involved with the granite and diorite; and interstratified with the slate is a thick stratum of white, finely crystalline, magnesian limestone (dolomite). This rock was quarried many years ago for the manufacture of lime; but it is now more generally known as the Stoneham marble. Unfortunately, however, the bed is too small and too badly shattered to render it available as an ornamental stone.

Through and over this ancient series of stratified rocks have been erupted in succession great volumes of diorite, granite, apparently of several different periods, and felsite; and it is interesting to note that these rocks follow each other in this order from north-west to south-east. The diorite is found almost wholly north-west of the main belt of slate and quartzite. To the south-west, and chiefly beyond the limits of the reservation, it is the usual finely crystalline, dark gray to black and rather unattractive variety so largely developed in the vicinity of the Boston basin. But in the vicinity of the Winchester reservations, about Bear Hill, along Main and Pond streets in Stoneham and in the district about Doleful Pond, the diorite is compact and greenish, looking much more like an altered surface lava than a deep-seated plutonic rock. In fact, it is extremely probable that the eruptive diorite here broke through the Cambrian strata and became effusive; and it may be that we have in this compact diorite a remnant of what was once a great volcano.

All through this north-western section of the Fells the diorite is repeatedly and intricately intersected by granite; the granite being commonly of a rather dark and fine-grained variety, and appearing in some cases to grade into the diorite. But south of and parallel with the stratified rocks is an almost continuous area of coarsely crystalline and typical granite, extending from the vicinity of Shiner Pool along the south end of Spot Pond, over Silver Mine Hill and across Bowery Brook to Winthrop Street in West Medford. One of the

finest exposures of this granite is on Hemlock Shore and Pickerel Rock, at the south end of Spot Pond; and this is one of the places where it can be seen to enclose isolated masses of slate and quartzite. Associated with this coarse granite along its south-eastern border, in the vicinity of Forest Street, Pine Hill, Brook's Lane and Winthrop Street, and marking in a general way the boundary between it and the felsite area, is a fine-grained, pinkish granite, which sometimes becomes microcrystalline, or even seems to pass into the felsite.

Isolated masses of felsite are of common occurrence in the diorite and granite areas, especially north, west and south-west of Spot Pond, the ledge of felsite east of the "Silver Mine" on Silver Mine Hill being a typical example. These are to be regarded as remnants or outliers of what was once a continuous sheet of felsite, covering probably the entire area of the Fells. The felsite is uninterrupted now, as previously stated, only over the south-eastern corner of the Fells, south of Ravine Road and east of Wyoming, Elm and Forest streets, where its flinty hardness has aided in preserving for us almost intact a considerable section of the ancient peneplain. The prevailing type of felsite in this area is a crystalline or profusely porphyritic variety; but along the north-western border, near the granite, much of it is compact or brecciated. South of the southern boundary of the reservation the felsite crosses Forest street and extends westward along High Street to West Medford.

The mutual relations of these different varieties have not been fully determined. It is a noteworthy fact, however, that here, as in the Stony Brook and Blue Hill reservations, the complex of granite and sedimentary rocks (and diorite) is seen in a general view to slope down to the south and south-east beneath an unbroken cover of felsite.

Dikes of diabase (trap) are a far more prominent and interesting feature of this reservation than of either of the others. One of these is, so far as known, the largest and most important dike in eastern Massachusetts. It begins in Medford, immediately north of High Street and a few paces west of Forest Street, with a width of over five hundred feet. It runs due north for nearly half a mile; and then, with diminishing breadth, north-northeast along the west side of Pine Hill to and across Forest Street west of Wright's Pond, where with a width of about fifty feet it passes beneath a small swamp and can be traced no farther. Southward this dike is believed to extend under the Mystic and the salt marshes into Somerville and possibly into Cambridge. The rock is coarsely crystalline, and especially remarkable on account of its extensive disintegration under atmospheric influences, forming an abundant brown gravel or earth, which has been extensively dug near High Street and in the vicinity of Pine Hill.



Two dikes have been noted which merit the especial attention of students of geology on account of their very coarsely and profusely porphyritic character. One of these is on the eastern boundary of Winchester and just north of the common boundary of Stoneham and Medford; the other is on the north side of the outlet of the North Reservoir. These dikes are in part packed and crowded with crystals of feldspar from one to several inches in length, giving them a very striking appearance, and presenting an interesting problem to the student of igneous rocks.

Large dikes of more normal character are very common, and in some instances they can be traced for considerable distances. The prevailing trend is east-west, the great dike being an exception to the rule.

As in the other reservations, the great ice-sheet accomplished but little in the Fells except to obstruct and divert the drainage; and all the ponds and swamps are to be explained in this way. Well-developed drumlins are wanting, and there are no important deposits of modified drift, although in the neighboring Malden and Mystic valleys sand-plains and eskers are a prominent feature. The most striking instance of diverted drainage has been noted in the case of Spot Pond; a comparatively slight excavation would suffice to restore its original southern outlet. In preglacial times the basin of this pond was simply a broad, open, upland valley. One of the most attractive special features of this reservation is the cascade, where Shilly-Shally Brook falls over the precipitous eastern edge of the peneplain. This may, perhaps, be regarded as evidence that the brook is not now following its preglacial course. Certainly it is strongly contrasted in its gradient with the other streams of the reservation, such as Intervale and Bowery brooks.

#### D.—BEAVER BROOK RESERVATION.

The Boston basin is a topographic trough, for the simple reason that the sedimentary rocks forming its floor have yielded more readily to the agents of erosion, since the elevation of the great peneplain plain of eastern Massachusetts, than the surrounding crystalline rocks. The streams tributary to the Boston basin have, however, notched its rims more or less deeply, in proportion to their size and erosive power. We have noted the wide and deep notches of the Malden and Mystic rivers, which have worn their beds down nearly to the existing base level for a distance of from three to five miles back from the edge of the basin. The valley of Arlington Brook is very much less advanced, the one hundred feet contour line crossing it within one and a half miles from the edge of the basin; while the notch through which the still smaller Beaver Brook enters the basin



is only fairly begun, the one hundred feet contour crossing it less than half a mile from the border. This part of the northern rim of the Boston basin is very sharply defined, rising abruptly from the forty and sixty feet contours to heights of from two hundred and fifty to more than three hundred and fifty feet. In fact, at the point where Beaver Brook finally debouches from the hills the contours are so crowded that it fairly tumbles over the edge of the ancient peneplain into the Boston basin. We thus see that it is virtually to the smallness of Beaver Brook that we owe the picturesque glen which forms the upper part of this reservation. It is quite unnecessary, however, to ascribe the erosion of this little valley wholly to the diminutive stream which flows there to-day; for it is certain that there has been a far grander rush of water down its rocky bed. During the closing stages of the great ice-sheet the water resulting from the melting of the ice formed both superglacial and subglacial streams, and the courses of the latter were, naturally, determined by the configuration of the ground. That Beaver Brook was once a powerful subglacial stream is proved by the extensive accumulations of modified drift (sand and gravel) through which it flows between the lower end of the glen and the railroad. These deposits take the form, chiefly, of exceedingly graceful, winding ridges or eskers, on which stand the noble oaks; and it is a matter of interest to students to note that we have here in such close connection (1) the upland area from which the detritus was washed, (2) the short, steep valley through which it reached the lowland and (3) deposits so suggestive in form and location of the slackening of over-charged currents of great force and volume. It is certainly inconceivable that the little brook which now winds quietly among these great banks of gravel can have played any part in their formation.

On gaining the lowlands, Beaver Brook turns abruptly to the westward, and its lower course is thus upstream with reference to the Charles River. This indicates that it has been diverted by the high drift hills south and south-east of the reservation; and we may fairly suppose that Beaver Brook and Clematis Brook were once independent tributaries of the Charles.

## NOTES ON THE VEGETATION OF THE RESERVATIONS.

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TO MESSRS. OLMSTED, OLMSTED & ELIOT.

DEAR SIRs:— I herewith submit the following hasty summary of my notes on the history and the present state of the vegetation of the metropolitan reservations. In accordance with your instructions, my purpose has been to make record of the main facts upon which schemes for the restoration of the sylvan scenery of the reservations may be based.

The perfecting of the landscape, not the securing of financial profit, is the end to be hereafter held in view. The forester's ideal forest consists of crowded, tall, clean shafts, for it is from such growth that the greatest quantity of clean timber can be obtained. While this ideal cannot be ours because of its sacrifice of beauty, it is undoubtedly true that the reservations offer a field which may furnish information of great value to the New England forester. If immediate advantage is taken of the present condition of the reservations, an unusually favorable opportunity is offered for the study of the effect of fires on different species of plants; of the ability of the stumps of different trees to sprout or the number of crops of sprouts they will provide; of the different seeding periods of different trees; the relative rate of growth of different kinds of trees, whether standing alone or in combination with others; the time required to seed areas of varying size with different kinds of trees of which there are seed-bearing specimens near at hand; the management of the ground-cover best calculated to encourage the growth of seedlings; the relative growth of trees with and without a dense ground-cover; the relative value of different kinds of animals as seed planters, — and many other questions of vital interest to the student of practical forestry concerning which he requires accurate information. The commission would do well to ask the most expert forester in the country to formulate such inquiries as could be most profitably entered upon. It may be remarked that under management for landscape, as under management for profit, large quantities of "by-product" will be produced, from which some income in money should be obtained.

The original notes from which the following pages are derived are preserved in the form of a card catalogue. The principal subjects of observation and inquiry have been as follows: explorers' references to the original forests; early settlements near the reservations, with special reference to industries which consumed wood or timber; settlements and clearings within the reservations; the steps of the natural process of reforesting lands once cleared for fields or pastures, but afterwards abandoned; the present condition of those woods which have been continually chopped, but never cleared; the available means of restoring sylvan conditions; the position and stature of the largest trees; the general distribution of species of plants and animals; the dates and the results of forest fires.

With respect to the study of the occurrence and distribution of botanical species in the reservations, I am happy to report that the cheerful co-operation of many botanists of the metropolitan district has been secured, and that good progress has been made towards a flora and herbarium.

Yours truly,

WARREN H. MANNING.

BROOKLINE, Dec. 31, 1894.

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#### A. — BLUE HILLS RESERVATION.

##### *The Original Forest.*

The meagre notes of a few early observers and a study of the present vegetation present the only means of determining the character of the primeval woods. This was not a "vast and continuous forest." The Massachusetts ("at the great hills") Indians were "a numerous and powerful nation." The level plain, just east of the reservation, where Quincy now is, was their meeting ground, and here was one of their "large corn fields." It was here also that an expedition from Plymouth under Standish in 1621 "came to a place where corn had been newly gathered." (History of Milton.)

Master Graves, in a letter appended to Rev. Francis Higginson's account of New England's Plantations, 1629, says: "It is very beautiful in open lands mixed with goodly woods, and again open plains, in some places five hundred acres, some places more, some less, not much troublesome for to cleere for the plough to goe in; no place barren but on the tops of the hills; in the lowlands and by fresh rivers, abundance of grasse, and large meaddowes without any tree or shrubb to hinder the sithe." William Wood, in his New England Prospect (1634), says of the territory now in Quincy: "There being great store of plane ground, without trees. This

place is called Massachusetts Fields where the greatest Sagamore in the country lived before the Plague, who caused it to be cleared for himself." (Topographical History and Description of Boston.) By this testimony we know that land near the borders of the reservation was cultivated long before white men gained a foot-hold, and that this cultivation decidedly modified the character of the landscape.

Probably no part of the Massachusetts Field came within the lines of our reservation. North-west of Hoosicwhisick Pond is Dotey's Plain, which also is said to have been an Indian corn-field. This field probably touched the west end of the pond, and it may have extended up the valley north-east of it. It is possible, too, that land about Braintree Great Pond was cultivated in the same manner. With these possible exceptions it is not likely that there ever was within what is now the reservation any open land not due to natural causes.

The white pine was doubtless the prevailing tree of the primeval forest. In the pine forests there were patches of hemlocks on the cool, rocky, cliff-like faces of hills. In the deciduous forests there were frequent patches of pine, and on the ledges cedars and stunted pitch pines. The tops of the greater hills were probably covered with a scrubby growth of deciduous trees mixed with cedars and pitch pines. On the dryer parts of the northern slopes of the hills chestnut predominated, and on the south slopes oaks. The white pine appears to have preferred either the well-drained parts of the slopes or the dryer, sandier parts of the plains. At the base of the slopes, where the soil was generally deeper and more springy, oaks and beeches and the larger birches prevailed; and in wet ground red maple and gray birch, sometimes one and sometimes the other predominating. Red cedars grew mostly in the crevasses and pockets of the most exposed ledges, and with them were sometimes a few and sometimes a great number of pitch pines; but this last tree attained its greatest development in moist, sandy land near the ponds. White cedar filled the swamp still called by its name.

The original forest must have been most impressive, with its assemblies of all native trees, some full of vigor pushing above and crowding out their fellows and becoming giants among them; others full of years, falling slowly to decay, with a multitude of seedlings struggling to take advantage of the patches of light thus opened up. The forest floor was sometimes a clean carpet of pine or hemlock needles, with a delicate tracery of ferns and evergreen creepers; again it was littered with fallen and decayed trunks and branches, covered with green and yellow mosses and filled in with thickets of bushes and ferns. Here and there were open glassy glades and

sedgy bogs edged with great overhanging trees and thick fringes of shrubs, everywhere a multitude of flowering plants, ferns and mosses in luxuriant growth, and an abundance of animal and bird life.

*The Destruction of the Forest.*

The timber of the white oak and the white pine was the first that was sought to supply the demands of commerce. Boston's first source of wood supply, the islands, was soon exhausted; but before this the lumber merchants and ship builders must have secured their larger timber elsewhere. That they early invaded the Blue Hills is evident, for we are told in the history of Milton that Balster Brook took its name (before 1669) from "Mr. Balster, a ship builder, of Boston, who in early times, bought standing timber in this section, and used the brook, when swollen by rain and melted snow, for moving it."

All buildings of colonial time were of timber, and heavy timber, too; all ships were made of wood. Firewood and charcoal were the only fuels, and they were burned freely in great fireplaces. In 1683 Rev. Peter Thatcher of Milton says that he received three loads of "coal brands" (charcoal), and in 1684 he says "in all, the town hath given me 29 loads of wood this winter."

In these early days care was taken to prevent an undue waste of timber, especially on "common land," and frequent enactments were made by towns to regulate the cutting. It was the practice at that time to cut only such timber as was required for special purposes. The first great scars were doubtless made by the cutting of the clear growths of pine and hemlock. The mixed forests were not seriously injured at first, although it was probably from these that firewood was taken. George B. Emerson says, in the "Trees of Massachusetts" (1840): "In felling for fuel the practice *has been* to select the old and mature trees, especially such as have begun to decay." This was the practice down to the beginning of the present century. As previously stated, the first timber was taken from the western end of the reservation, for it was from this end that it could be most easily transported. About the same time iron works near the east end of the reservation were making inroads upon the deciduous forest to procure wood and charcoal; they also tore up some of the low ground for bog iron ore. It is probable that the greater part of the surface of the reservation had already been cut over a hundred years ago, and that since that time there has been nothing of much importance taken from the land beyond firewood cut from sprouts.

With the felling of the timber came settlements. At first the Indian corn fields and the natural meadows were cleared and culti-



vated; but in the course of a hundred years all suitable land of this kind was taken up, and clearings were made in the valleys at the base of and among the hills, and these clearings soon extended well up the more fertile slopes.

Fire was one of the principal means used for clearing land; it was used even by the Indians before the advent of the white man. While it was probably the intention to keep the fires within the limits of the cleared land, they undoubtedly did from time to time sweep through the woods, with increased frequency as the settlements increased. They were probably at first not as destructive as in later years, for the trees were larger, the surface moist, and there was not such an accumulation of inflammable material on the ground.

After a time the rude farms of the scattered settlers ceased to be profitable; first the worn-out pastures were abandoned, then the cultivated land was turned into pasture land, and finally many of the old houses were allowed to fall to decay. After this the only source of profit was the woodland, and to realize a profit quickly, the rapid and cheap method of clearing the land of all the growth as soon as it became large enough for firewood was adopted. As a result of this there were large accumulations of brush, and as these cuttings and as these accumulations increased, so increased the frequency and fierceness of the fires. These fierce fires killed the standing sprout growth and even the large trees, and these, falling, added new fuel to the next conflagration. This process, long continued, tended directly to the extermination of all valuable trees, and to the substitution, therefore, of such plants as the scrub oak. To-day a large area on the south-east slope of Rattlesnake Hill, quite capable of supporting better trees, is covered thickly and almost exclusively with scrub oak.

#### *The Existing Forest.*

As we now approach the Blue Hills they seem to have a nearly uniform deciduous covering, broken only by occasional small groups of pines, and by dark patches of cedar on the shrub-covered ledges and hill tops. The deep shadows and heavy masses of color derived from forests of hemlock and pine have long since disappeared.

It is not likely that a single acre of the reservation has escaped the woodcutters' axe, unless it may be the stunted growth on a few hill tops. If there are living relics of the time when white men first entered these woods, they can only be old trees, and it is very doubtful if any of these can be dated back to this period. A very curious old hemlock, perched high upon the top of a massive boulder and forming a town bound between Quincy and Braintree, must have been living when Quincy was incorporated in 1792. Perhaps some of the

trees that are recorded as marking the lines of the "Blue Hills Lands" and the various town boundary corners are still in existence. Of the few large trees standing within the reservation it would be rash to assert that any of them are over two hundred years old.

With the exception of the hill tops, pools, bogs, swamps and meadows and the open or recently abandoned pastures, the reservation is "sprout land" covered with stumps, from which spring sprouts varying in age from those on land chopped or burnt within a year to a growth of twenty or thirty years. In other words the ground is covered with a dense thicket of brush, a crop of scrubby sticks or a forest of poles. The surface has been repeatedly burned; and frequently the brush, the sticks and the poles are dead and falling in a tangled mass with a new set of sprouts pushing from the old stumps. The surface covering is dismally monotonous. It consists of low shrubs of a few species, or it is a black and bare surface with only a few charred sticks and stumps standing among the blackened trunks of the half-killed trees. Occasionally on this burned ground there are interesting growths of herbaceous plants, and in wet places, rock-bound glens and hill tops, where the fire could not go, there are sometimes many flowers and ferns; but such localities are rare, far between, difficult of access and of limited area.

The ravine below Hillside Pool, Witch-Hazel Run, the little glen at the Crossman Pines, Sassamon Notch, the vicinity of Hoosicwhisick Pond, and the swamp along Monatiquot Stream are all interesting botanical localities, and so are the runs that are kept constantly moist, from their source in the pools and bogs of the hills down to the more level land of the valleys. These wet places are so important that a somewhat detailed description of their formation and character seems desirable. The pools are reservoirs and the bogs and swamps are great sponges holding the waters that flow rapidly down the steep rocky slopes and dealing it out gradually to the springs and streams. The pools are generally round and dark, with black, muddy bottoms and quaking, boggy shores, on which grow thickets of sedges, cat-tails, bushes and trees. They are rock basins full of water that are gradually filling up with vegetable matter. That they have not yet become bogs is due to their small and barren water-shed and the enduring character of the rock about them from which little material is accumulated.

The bogs have a greater water-shed, for they are usually at a lower elevation. What was a pool in their centres is now a basin of soft mud, full of cat-tails, with fringes and bunches of bushes on the edges and on the slightly elevated parts. The dryer and better-drained parts become swamps, and so does the whole bog when its surface becomes sufficiently elevated to allow a certain degree of

drainage. The swamps at the head of Chestnut Run and north-west of Sassamon Notch were probably once bogs.

Where the valleys through which streams flow have a gradual fall and a flattish bottom, they hold water enough to make them swamps. The swamps have sufficient drainage to permit a growth of trees, usually red maple and gray birch, or in Cedar Swamp the white cedar, which is, however, replaced when cut off by the maple and birch, probably owing to better drainage in recent times since the old hillside forests were felled.

Outside of such places and a few interesting bits of woodland there is but little sylvan beauty. This beauty will come in time. After all, it is but the garment of the splendid hills and valleys from which are obtained the magnificent panoramas and beautiful views that impress every one with the value of the reservation, notwithstanding the barrenness of many of its parts.

#### *Nature's Processes of Restoration.*

In the Blue Hills forest destructive agencies have hitherto wrought havoc; now the balance is to be turned. Nature, freed from the curse of fire, would in her own way ultimately restore the forest. If we would assist or hasten the process we must study and adopt her methods.

When the great oaks, pines and hemlocks of the early forest were cut, there at once sprang up a host of seedlings that had been smothered and held in check by the overpowering shadows of the great trees. Sometimes the young pines gained sufficient headway to restore patches of pines on the site of the old trees. The hemlocks were seldom able to do this. When these patches of young pines were cut, they were succeeded by hard-wooded trees, as was also the most of the old pine forest when it was cut. Thoreau says: "While the wind is conveying the seeds of pines into hard woods and open lands, the squirrels and other animals are conveying the seeds of oaks and walnuts into the pine woods, and thus a rotation of crops is kept up." Examine closely the forest floor under large pines, and there will be discovered great numbers of little stunted oaks, hickories, maples and other hard-wood trees. Dig them up and it will be found that they have roots which are big as compared with the tops. These plants are only waiting for more light to spring into growth. After the felling of the primeval conifers these plants grew so fast that they crowded out the greater part of the young pine and hemlock growth. Then they in turn were cut, and from their stumps and the succeeding stumps successive crops have been cut down to the present time.

Such parts of the forest as were cleared and cultivated became practically free of native plants. A few weedy kinds persisted for a time, but their place was soon taken, as elsewhere in New England, by foreign weeds. When the cultivated fields became too worn out to produce good crops or good hay, they were pastured. Slopes that were too rough or too steep for crops were cleared primarily for pasturage. In the abandoned fields certain of the weeds of cultivated lands persisted. Into these fields came also certain of the shrubs cultivated for ornament about the houses, such as barberry, privet, buckthorn and sweet briar. These plants have persisted, too, where the houses have long since rotted away; and it is reasonably safe to assume that there was a settlement of some kind where a large colony of old plants of two or more of these varieties appear. They are not always present in the pastures, but, on the other hand, they sometimes make up the greater part of the groups of shrubs. With or without these foreigners came the plants of the ledges, hill tops and edges of open wet places; and they thrived, for they found congenial conditions of light and openness, together with a good soil, such as they had not enjoyed in the places to which the shade of the old woods had banished them.

The Hancock Pasture is said to be, and has the appearance of being, the oldest pasture in the reservation. The ground seems exhausted, but it is covered with a considerable variety of plants, all remarkably dwarfed. There are plants of *Setaria* (a grass) only two or three inches high, of rib grass (a plantain) with leaves an inch or two long, and many others as dwarfed, but all having fertile seed. These are plants that would ordinarily grow a foot or more in height. The growth of birches, junipers, etc., about the edges, indicates that this pasture would have been long since covered with these trees, if the young plants had not been persistently taken out.

East of Balster Brook is a section which well shows the progress of development from a closely grazed pasture of more recent times. First appear such plants as the trailing junipers, sweet fern, bayberry, wild rose, dwarf, high and half-high blueberries and the huckleberries. The shrubs appear first in small groups, the beginnings of which are tufts of coarse herbaceous plants. These groups gradually spread by the addition of other plants, but they are kept in check by browsing. The red cedars, which often appear first and become well established before the shrubs gain much headway, soon push ahead and form the centres of groups, or stand as individuals in the open pastures. Then appear the gray birches, pushing into the edges of the pasture and creeping into the groups of shrubs, gradually gaining a strong foothold, finally crowding into the grazed pas-



sages, then growing with surprising speed until they overtop the red cedars and all the bushes.

While the wind is spreading the seed of the birch and it is gaining ground for a burst of growth, the squirrels are planting chestnuts, oaks and hickories, and soon seedling plants of these sorts appear with the birches in the clumps of bushes. They are the tortoise of the fable, while the birch is the hare. The nut trees follow slowly, but in years they overtop the birches and the latter begin to fail. The cedars that had before been made thin and poor by the shade of the birch now die outright, and many of the shrubs that maintained "a long-drawn-out existence" under the birches disappear. A multitude of shade-loving plants now come in, and once more we have the beginning of a real forest.

In some of the old pastures trees were left standing to furnish shade for cattle; these are now the large deciduous trees of the reservation. Their broad, low-spreading tops bear testimony to their having stood long in open pasture. Those which still stand in open land, like the oaks and chestnuts near Hancock's Pasture, are fine trees. Similar trees about which a new growth has sprung up, like the large chestnuts in the woods east of Marigold Brook, are now losing their lower branches.

The nature of the growth following pasturing appears to depend somewhat upon the soil. On a poor soil the shrub growth may be omitted, and birches, junipers or pines come in first. It depends also upon the animals that have browsed the surface. Sheep will eat almost anything, and the surest way of killing sprouts in a pasture is to overstock it with sheep. Cattle are more fastidious, and horses still more so. The ancient pasture on the slope of Chickatawbut was for a long time browsed by sheep, and parts of it now show evidence of this in the fact that there is a limited number of the plants that are usually found in pastures, and that the growth is made up chiefly of wind-sown birches and squirrel-sown nut trees.

#### *Management for Restoration.*

Before any permanent progress can be made towards restoring the primitive beauty of the woods, fires must be controlled and prevented.

After diligent inquiry it appears that extensive conflagrations occurred in 1864, 1873, 1884 and 1893. During each period of ten years sufficient brush accumulated from cuttings of cord wood in various parts of the reservation, from the fallen trunks and branches of trees and sprouts that were killed by previous conflagrations, from leaves and the growth of ground-covering plants, to furnish material



that only required a continuous period of drought, a strong wind sweeping across the length of the reservation and a little spark, to produce a blaze of irresistible fierceness. That a fire very soon gets beyond control when such conditions are presented is the testimony of the Blue Hill meteorological observers and others.

No one who passed through the reservation during the summer of 1894 could have failed to notice the woeful destruction caused by the fire of May 21, 1893. On the top of Wolcott, Hemmenway, Boyce and Burnt hills, so much of the existing growth was killed that large areas appeared, when viewed from a distance, as black and barren wastes of dead tree tops relieved only by new sprouts from the stumps. Similar destruction was wrought by the fire of May, 1892, on the north slope of Chickatawbut, and on the summits of Wampatuck and Fox hills. On Wolcott Hill white pines a foot in diameter were killed outright, the flame apparently having run to the top of forty-foot trees. Generally the destruction was greatest on the hill tops, where the wind had full sweep. In no place, however, was the destruction greater than in the valley near Five Corners, for here were killed chestnuts and oaks eight to ten inches in diameter such as commonly withstand fire. This peculiar circumstance is explained by Mr. Clayton of Blue Hill Observatory (who watched the fire), by the direction and fierceness of the wind, which, being north-west, blew directly through this valley and made it a furnace.

The fire-killed brush begins to fall within a year, and soon makes an impassable tangle. It is to be observed that the fire of May 21, 1893, jumped across Hillside Street, a road which runs across the direction of the wind, while it stopped at the narrow woods road running with the direction of the wind, south of Buck Hill. It is to be observed, too, that the moist runs checked the progress of the fire, and that in some places they stopped it. Ledges also acted as fire checks, but not in the same degree as the wet runs.

To control fires, the first and most imperative duty is to train and organize the men on the ground, so that they may fight fires to the very best advantage; to provide at frequent intervals stores of fire-fighting appliances; to search out and keep clean all springs; to provide tanks and cisterns where springs are not to be found; to arrange a code of signals by means of which to concentrate a strong force at one point quickly; to provide on elevated places lodges where some one might be constantly on watch. Such an organization, to be effective, would require that a considerable force should live within or near the reservation. The lodges would provide homes for the working force, and they would also provide places where visitors might rest or find simple refreshment. It is equally important that extensive areas of fallen brush be removed at the earliest possible period;

and this should be done in advance of the cutting of dead standing brush, which is not a serious menace while it stands.

To check the spread of a fire once under way, fire guards should be provided. These may be roads running in the direction of the prevailing winds, and kept free of brush and leaves for some distance on either side, and wet runs having a direction either with or across the wind, cleared of trees and brush and kept free from all rank growth. Where they lie across the direction of the wind, the width of clearing would need to be made greater than where they run with the wind.

Assuming that fire will no more sweep the reservation, we have next to inquire as to the kind of work which will need to be done in order to preserve or increase the beauty of the woods and fields.

Of the pastures a lover of the out-door world thus writes: "This scenery, with all the spontaneous mapping of its beds of shrubbery, its groups of trees, its tussocks of mosses and ferns, its little green hollows spangled with flowers, and its projecting rocks covered with brambles, all intersected widely by the smooth greensward, is peculiar to New England." Such scenery ought to be preserved, because it is very beautiful in itself, because it provides an important element in the general landscape, and because the throngs of people who will ultimately resort to the reservation will have need of open land. If left to nature, all ground that is now pasture will grow up to woods. The lawn-mower is not to be thought of, — the scythe would ruin half the beauty. It is only by grazing that this pasture land can be preserved and kept beautiful. Flocks of grazing sheep and cattle add an element of interest and beauty to landscape, and they yield a return greater than the cost of their maintenance. The number and kinds of grazing creatures will only need to be so regulated and transferred from one spot to another as to keep the various pastures in the best condition. While grazing is the one way to preserve the pasture scenery, it is ruinous in a growth that is designed to be woodland. From all such territory browsing herds must be excluded, unless they be deer that would be confined to territory best adapted to their needs, with the expectation that they would modify the herbage in their way.

Much of the land on level ground that was once pasture should again be made pasture and park-like land. It is only on such land that there are found any number of large trees or of vigorous and healthy young seedling trees, and it is only here that the soil is good enough to support a turf strong enough to stand the wear of crowds.

From the existing sprout land it is probable that from three to six successive crops of firewood have been taken. There probably was considerable pine cut for firewood after that suitable for lumber had been removed, but deciduous wood succeeded it. With the first crop

of sprout wood there must have been a larger proportion of seedling trees than with succeeding crops, and it is from the stumps of these seedlings that the best of the succeeding crops have been taken. The seeds in the ground being exhausted, the seedlings smothered by the rank growth of sprouts, the old stumps more and more weakened, the fires more and more destructive, the decadence of the forest has gone on until now on a large part of the territory the deciduous growth is so poor as to be practically worthless. Even the best of the existing sprout growth will not make a fine forest, for only sprouts from very young trees ever make fine trees. Sprouts from older stumps soon come to maturity. Geo. B. Emerson, in the "Trees of Massachusetts," makes the following statements as to the time required by the sprouts of different trees to come to maturity. The statements are based on the answers to many letters. Gray birch may be profitably cut in from ten to twenty years; maple, ash and the other birches twenty to twenty-five years; oak in from twenty to thirty-three years; white cedar (which grows from seed), forty years; pitch pine (also from seed), forty to sixty years. He also reports that most kinds of hard woods are worth twenty or thirty per cent. more for fuel at the age of twenty-five years than they are at seventy-five years, and that shoots from old stumps, though they may spring up, die in one or two years.

To artificially plant the large areas of ground which to-day are covered with exhausted or nearly exhausted stumps would be an expensive undertaking. If it was the aim to ultimately make the forest the greatest source of financial profit rather than the greatest source of pleasure to the people, it might perhaps be in order to seriously consider the artificial planting of large territories. Under the existing circumstances, however, nothing of this kind need be attempted.

Wilson Flagg writes that "Open growths, fragments of forest and inferior groups alone are particularly interesting in landscape. An extensive and unbroken wilderness of wood affords but a dreary prospect and an unattractive journey." The vegetation of the reservation needs to be managed so as to secure the utmost variety, including ample areas of "open growth." For the accomplishment of this purpose advantage may generally be taken of growth now on the ground. It is well known that pine succeeds a hard-wood growth. Portions of the reservation are evidently ripe for pine, and would have been covered with it before now if the seedling trees had not been destroyed by fire before they were large enough to successfully withstand its ravages. Single pines are generally distributed throughout the reservation. These scattered trees are generally old enough to seed, and in several places where fire has been kept out for a number of years young pines are already numerous. Even in the badly burned dis-

tricts a few of the seedlings about the older trees have escaped the fires. The same holds true with reference to hemlocks, and, with fire controlled, they too would spread in favorable localities.

There are, to be sure, some sections where there are few pines to furnish seed and where the deciduous sprouts are too weak to be worth saving; but in most of these sections there is a well-established ground covering of low shrubs which will cover the surface attractively when the old stumps are killed. Such would be the case on the west slope of Wampatuck, for example, where the surface would very soon be covered with sweet fern, bayberry, dwarf blueberry and red root.

There are other sections where seedlings of deciduous trees are starting among the sprouts in sufficient numbers to take their place and make good trees. This is usually the case in abandoned pastures on steep slopes, where a tree growth would be desirable; for example, in abandoned pastures on the west slope of Chickatawbut and the east slope of Buck Hill.

Near a few spots which possess no satisfactory shrub cover, no seed-bearing pines and no deciduous seedlings, there are old nut trees which may be depended upon to furnish seed to stock the ground. It will not be difficult to devise still other ways of bringing about the desirable self-restoration of the woods.

In deciding between methods of treatment when more than one method is possible, the choice will depend upon considerations connected with landscape. Thus all possible prospects over the land within the reservation to the landscape which lies beyond must be considered. For example, to keep the view open from Babel Rock, the scrub-oak covering of the summit should be encouraged. Below the dwarf oaks hornbeam, flowering dogwood and gray birch may find place and below these, larger trees must be so selected from year to year, as to hide the view of houses in West Quincy without unduly obstructing the view of the ocean. Again, the view from the summit of South-east Ridge is fine on every side; it is the best point within the reservation from which to view the range of hills; but to keep the view open a large area must be stripped of all large growing trees, and the growth of the low scrub oak encouraged. Attractive views are to be had from the old road running down this ridge which could be opened by judicious thinning so as to catch a series of beautiful pictures between the trees. The same treatment might advantageously be applied on the upper part of the west slope of Blue Hill, below the summit.

There is a fine view on the west side of Hillside Street across a long stretch of tree tops to distant hills. This view ranges so close to the tops of the forest (and in this lies much of its beauty) that



careful exploration and cutting over a long stretch of woods would be required to keep it open permanently.

Directions for the restoration, encouragement and development of the vegetation of the reservations on the lines laid down cannot be formulated in rules. An intimate knowledge of the ground and of every kind of plant occupying it, a knowledge of their nature and of the combinations that naturally appear together under different conditions, will be found essential. To attempt to encourage the growth of plants under conditions which are not suited to them will not be successful. Success may be achieved in gardens, but it certainly will not be reached in the wild state. There are years when trees seed freely, following which a series of short crops may be expected. These periods must be determined for those trees from which seed is to be obtained, and the ground must be properly prepared to receive the seed when it is ready. If the ground is too shady the seedlings will be shaded out; if too sunny, they will be scorched to death. As the trees grow they must be watched to see that they are not smothered by undesirable growths. They must be thinned so that the ultimate result desired will be secured. Too much thinning or too little at certain times would seriously injure or even ruin years of work and growth. All these and many other considerations will necessarily govern the work of restoring the beauty of the forest landscape of the Blue Hills.

While it may not be desirable or practicable to plant large areas of forest, there will undoubtedly be a large amount of planting required from time to time along the sides of new roads about buildings, at points along the boundaries to screen unsightly objects, and in many raw places within the reservation. To supply plants a nursery should be established; for it is far more economical to grow than to purchase large quantities of plants, especially natives. Better results, too, can be secured from plants taken directly from a nursery close at hand than can be hoped for if the plants are brought from a distance. It is desirable, also, that the nursery should be established in advance of roads and paths, because many plants can be secured from the routes of these constructions before work upon them is begun. In addition to supplying plants for the reservation within which the nursery may be established, certain varieties not indigenous in other reservations might be grown for exchange.

The principal nursery ground should be that on which the largest number of varieties may be grown successfully. It should be neither too wet nor too dry, and for convenient management it would best be nearly level. It should not be so placed as to be a disagreeable element in the landscape. It would be well if it could be near the central place of administration. Probably the level land south of Houghton's Pond would be the best place for a nursery. Here the



surface indications would lead one to believe that the soil was very poor; but this poverty and exhaustion of the surface is probably more than offset by the fact that there is a constant supply of water near the surface, and that the soil is of such a nature that if properly worked and fertilized it will by capillary action keep the roots supplied with moisture. These conclusions are justified by the results that have been secured in nurseries established on similar soil in Plymouth County. In addition to this principal nursery ground, it would be well to select in different parts of the reservation pieces of ground especially well adapted to the growth of certain plants requiring special conditions. Such nursery spots would ordinarily serve temporary ends, and often could be so managed as to appear only as an unusually luxuriant or broad-spreading natural locality for the plant in question. Provision for a liberal supply of a large number of kinds of native plants is of great importance; for, while the spaces to be planted may be but a small part of the total area of the reservation, it is very desirable that they be planted at an early date, and planted well. After a record of the plants now growing on the reservations is completed, the introduction of new species is to be considered. Care must be taken to give these plantings a natural appearance, and the whole work ought to be done in a far more rapid, economical and wholesale way than is usual.

#### B. — STONY BROOK RESERVATION.

##### *The Original Forest.*

Suggestions of the probable character of the primitive growth are found in the occasional pines in the upland, in the old cedars on the ledges and in the thickets of shrubs in the valley. We may safely assume that the cedar-covered ledges, wherever we find them, retain more of their primitive appearance than any other section of the upland. Back of these and along the greater part of the highland there are fragments of pine growth, young and old, suggesting the forests of great trees that made up the framework of the picture which the Indians viewed from a few of the open ledges and projecting points. On some of the dry ridges the pines came close up to the tops of the steep slopes; in some well-drained valleys they came down into the bottoms. In a few wet valleys the oaks and maples made a bay of deciduous foliage among the pines. The few treeless meadows were filled with dense and almost impenetrable thickets of high bushes in the dryer parts, low shrubs, coarse sedges and grasses on wetter ground, with large patches and broad fields of cat-tails in the bogs. The scenery must have been far more impressive and varied than it is now; because of its dark and high framework of conifers. It is such scenery that is now gradually to be restored by the skilful use of resources still remaining on the ground.

*The Decadence of the Forest.*

The ground covered by this reservation appears to have been too rude and rocky on its edges and too swampy in its centre to invite the early settlers, especially as there was ample store of more tillable land all about it. No records have been found of old roads passing through the reservation excepting those crossing its narrow ends. No records of early settlements or of extensive cultivation within its area have been noted, and little has been found on the ground to indicate that there ever were any such settlements. On the top and on the northern slope of Bellevue Hill there is pastured land which probably was cleared of the original woods many years ago. The cleared land on the south side of Washington Street was brought into cultivation after Washington Street was opened as the Dedham Turnpike. On this turnpike, at the summit of Muddy Pond Hill, as Bellevue Hill was once called, was situated the old toll house and gate. At the southern end of the reservation there is a limited area of cultivated land which may have been cleared at an early date. Fires have passed through the reservation from time to time, but the damage has been slight as compared with that done in the Blue Hills not far away. The conditions with respect to fire are similar to those prevailing in the Fells. The territory is well broken up by wet land, water and moist runs, and its longest direction is across the prevailing winds. The richness of the flora tends to show that the surface has been but little disturbed by cultivation or by grazing. The place has long been a favorite collecting ground for botanists.

*Management.*

The arborescent flora of this reservation corresponds with that of Middlesex Fells, while the condition of the growth is much like that in those sprout lands of the Blue Hills, where fires have done the least damage. Evidently the whole territory has been cut over repeatedly for cord wood, and much of it has been cut within a few years. In many places the old stumps are about worn out, and there are few young seedling trees to supply their successors. In certain sections, notably in the upland on the eastern side in about the centre of the reservation, the white pines are ready to take the place of the deciduous growth. There are mother pines well distributed over a considerable territory, and colonies of offspring are already established about them. In all the sprout land, whether it be recently cut or covered with nearly matured trees, it should be the policy to gradually develop a more permanent seedling growth, and as the conditions on the dry land are much the same as those that prevail in the

Blue Hills, the same treatment will apply here. A growth of pines should be encouraged where the land is evidently ripe for them; and in other places the existing low ground covering may well take the place of the old sprout growth. In and along the edge of the wet land, which makes up a considerable part of the reservation, there is already an interesting, luxuriant and varied growth of shrubbery and promising seedling trees, which need but little attention to develop into a more mature beauty than they offer now.

This reservation, like that at Beaver Brook, will soon be thronged with people, not only in summer, but in winter, when skating is good; and provision must be made at an early date to keep these visitors within proper bounds, and to provide the necessary open space for their accommodation. Open ground can be secured on lands at the northern and southern ends of the reservation. Provision for a nursery can also be made in cultivated land at the northern end, and into such a nursery there can be gathered a stock of plants, that are to be found in considerable quantities here and not in the other reservations.

#### C. — MIDDLESEX FELS RESERVATION.

##### *The Original Forest.*

Capt. Myles Standish, who voyaged and marched up Mystic River in 1621, said of the country that it was "the paradise of all those parts." In 1629 Rev. Mr. Higginson, speaking of the land about Charles River, says: "Though all the country, be as it were, a thick wood for the general, yet in divers places there is much ground cleared by the Indians." In the Charlestown records we find a territory including a part of the Fells referred to, as being covered with stately timber, and it is said that "all the country round about" is an "uncouth wilderness full of timber."

It was the stately timber and the wilderness in which it stood that impressed the early observers of the Fells region, for here there was no continuous range of "Blue Hills" to make its mark in the horizon, there were no barren hill tops to give an impression of elevation, there was less open land near the base of the hills and the hills themselves were buried in dense forests.

To see the Fells it was necessary to go into them and to get onto the tops of their hills. Even then the beauty and sublimity of the great forests must have left a stronger impress on the mind of the observer than the grandeur of the views; for there were but few places where distant prospects could be secured, owing to the growth of trees, which here covered the hill tops. At a few points only open land may have appeared, as along the "Mistick" and about Doleful Pond.

Great forests of pine "more than a gun shot high" and lesser forests of hemlock covered the valleys and the slopes of the hills, and many of them remained to within the memory of living men. Many of the hills were topped with a growth of cedar, others with oak and hickories mixed with pine, and still others with pine. The more fertile slopes and the edges of the meadows bore groves of great oaks. Canoe birches were to be found near the edges of swamps, and they brightened wonderfully the sombre banks of hemlocks and pines that rose behind them. In the swamps were maples and gray birches mixed with oak and pine, but they were interrupted by the ancient reservoirs of the beaver. There were dark patches of white cedar on the edges of Spot Pond and in swamps near Bear Hill. One of the earliest explorers of this "uncouth wilderness," then called "The Rocks," later "The Five Mile Woods" and now the "Middlesex Fells," was Governor Winthrop, and it is thus that he records his experience: "Feb. 7, 1632. The Governor, Mr. Nowell, Mr. Eliot and others, went over Mistick River at Medford; and, going N. and by E. among the rocks about two or three miles, they came to a very great pond, having in the midst an island of about one acre, and very thick with trees of pine and beech; and the pond had divers small rocks standing up here and there in it, which they therefore called Spot Pond. They went all about it upon the ice. From thence (towards the N. W. about half a mile) they came to the top of a very high rock, beneath which (towards the N.) lies a goodly plain, part open land and part woody, from whence there is a fair prospect; but it being then close and rainy, they could see but a small distance. This place they call Cheese Rock, because when they went to eat somewhat they had only cheese (the Governors man forgetting for haste, to put up some bread.)"

### *The Destruction of the Forest.*

The early settlers had a far greater appreciation of the value of the forest than Americans generally have at the present time. This was undoubtedly due to the value placed upon such growth and to the care used in maintaining it in the country from which the colonists had so recently come. Enactments to prevent an undue waste of the growing timber on "common lands" appear at very early dates in the records of adjacent towns.

In 1653 an order was passed by the selectmen of Charlestown "that no inhabitant of the town or any other town shall under any pretence whatever fell or cut down any tree upon the Common without the neck, or the common beyond Mistick Pond within Charlestown bounds or the common on Mistick side belonging to Charlestown,



without first acquainting the selectmen therewith upon the forfeit of what the selectmen shall see meet, who are to judge according as they are to conceive of the offence." This rigid enactment evidently was not held by the citizens to apply to the commons of neighboring towns, for about 1689 Malden was obliged to give repeated warnings to their "Charlestown neighbors against cutting off wood and timber from the common lands" ("which is very small and rockie"). In 1689, at Malden, it was "*Voted* at publick towne meeting, that no young trees under a foot over, are to be felled for fire wood under a penalty of paying five shillings for every such tree." (Historical Discourse by S. O. Wright.) In 1673 the Stoneham history says: "There was a large trade in cedar posts, shingles and clapboards. The selectmen granted many of the inhabitants permission to cut trees in Cedar Swamp near Spot Pond, and John Mousal was charged with the duty of inspecting the number and bigness of the trees cut down."

This careful protection of the forest continued so long as extensive tracts of land were held in common; but practically all of the land had passed into private ownership a hundred and fifty years after the first settlements were made near it.

In 1694 Malden's "common land" became proprietary land, for it was "*Voted* that ye common shall be divided: bottom and top, yt is land and wood," and it was ordered that the commissioners making the division "employ an artis to lay out the lots." The town of Stoneham was set off in 1725 from Charlestown, when the meadows near Spot Pond were ordered to be improved for maintaining the Orthodox minister.

During all this time the character of the forest growth was being modified. Extensive herds of cattle roamed the woods and browsed from its herbage and young growth. In 1634 Governor Craddock was granted land. His property of about 3,500 acres included a large share of the southern part of the Fells. This same year Wm. Woods says: "On the east side (of Mistic River) is Mr. Craddocks plantation where he has impaled a park where he keeps his cattle, till he can store it with deer." "Medford early supplied Boston with milk," and "It was a common practice to allow cattle and swine to roam in the woods until deep snow came." (History of Medford.) As early as 1662 citizens of Malden petitioned for a new grant as far away as Concord, N. H., on the ground that there was not enough room for their cattle on the commons.

The cutting of timber must have begun very soon after settlements were made, for it is recorded that saw mills were established on the edge of the Fells at an early date. One stood just below the present North Dam, another on the outlet of Spot Pond, and another on



Bowery Brook, and their principal source of supply must have been the Fells region.

Serious injury from the early timber cutting was not immediately evident, for it seems to have been the almost universal practice up to the present century to select only the best trees for timber, and the old and decaying trees for firewood, leaving the young trees to perpetuate the forest. This selecting of the old growth and preservation of young trees continued on parts of the reservation to within about fifty years, or within the memory of living men. Mr. N. A. Richardson of Winchester recalls when Turkey Swamp was surrounded with pine and oak groves, made up almost wholly of large trees, with but few small or medium-sized trees among them; he remembers, too, when they were cut for ship timber and teamed over the old road to Medford. The last of these old groves was felled between forty and fifty years ago. Mr. Ezra Sprague of Stoneham remembers when numerous pines were growing on Gerry's Hill and in many parts of the territory south of this, among the deciduous trees. His father told him that in his day the cedars were so thick in cedar swamp that an "ox could not be led between them." The greater part of this growth had disappeared forty years ago. The destruction of the woodlands went on more rapidly, as towns grew on all sides of the region. Some early settlements were made within the limits of the reservation; they persisted for years, but were eventually abandoned. There are cellar holes along the old road that once extended through the valley west of Bear Hill in a nearly direct line to the East Dam. Cellar holes and other evidences of ancient settlements are also encountered on the roads north and east of Spot Pond, along Wyoming Avenue, along Woodland road and Forest Street and in protected valleys along the western edge of the reservation,—in all not far from twenty. Some of these cellar holes are so old that all trace of the people who once lived above them has been lost.

The importance of one of these settlements, namely, that in the neighborhood of the present North Reservoir, is indicated by the appearance of the old road that follows the valley close to the western base of Bear, Winthrop and Gerry hills, then through the reservation to the East Dam, and southward in a nearly straight line to the edge of the reservation, where it trends to the east and passes into Medford. There is a deeply worn channel in many places along this road, which gives evidence of the heavy travel over it. In the course of the construction of the Winchester North Reservoir a long stretch of corduroy was found along the line of this old road, which was made of twelve-foot logs of red cedar.

While the old roads of the Fells do not all lead to Medford, most

of them do, for it was to this town that great quantities of timber were transported to be used in the construction of ships. Beside Mystic River the first ship constructed in the colony, the "Blessing of the Bay," was launched, and here also Mr. Craddock's agents began the construction of vessels as early as 1634. This industry grew in importance, until between 1802 and 1846 three hundred and seventy-five vessels were constructed.

Brick making has been an important industry in and near Medford from an early date up to the present time, and much of the great quantity of cord wood required for this industry came in early years from the Fells. Great quantities of firewood must also have been taken from the territory to supply the needs of the people about it. It was the winter's work of many of the inhabitants to cut firewood in "sled lengths" (eight to twelve feet) and haul it to their yards, where it was cut up in short lengths for the great fireplaces.

Another industry, the manufacture of shoe pegs, was responsible for the early destruction of a tree that was once an important element in the landscape of the region, — the canoe birch. I am told by Mr. Richardson that there were at one time large numbers of these trees, "from the size of a wash basin to a barrel" about Turkey Swamp, but that they were cut off to supply a shoe peg factory which was established in Montvale about seventy years ago, but was abandoned about fifty years ago. It is quite possible that this factory was abandoned because of the exhaustion of this birch, which is known to be rare and scattered for some miles about the location of this industry.

As compared with the Blue Hills lands, the Fells lands have from the first been more closely surrounded by settlements and industrial establishments; they have possessed a greater value, and they have been more frequently transferred. Nevertheless, it appears that the original timber remained standing in the Fells in good condition for as long if not for a longer period than it did in the Blue Hills. This may be accounted for in a measure by the fact that so much of the Fells land was held in common, and was thus controlled for a longer time. When the surface was cleared, however, a very much larger part of it was almost immediately brought into cultivation, much less of it allowed to grow up to sprouts. Appearances indicate that about all the good land on the reservation was at one time cleared and cultivated or pastured. We know that this was true of a large territory called the Bryant Pasture, west, south and east of Bear Hill; of another territory early referred to as the Spring Pasture, east of the Middle Reservoir; of a considerable section east of Spot Pond, and again south of the North Reservoir. Other sections concerning which we have no certain record of clearings show evidence,

in the undergrowth and the seedling character of the tree growth, that the woods were cut off, the surface then pastured for a considerable time and then allowed to grow up to trees. The practice of turning cattle into the woods, previously referred to, may have been responsible in some places for the present pastured appearance, for browsing tends to keep down all young trees and to encourage the formation of open, pasture-like glades.

Fires evidently had their share here as elsewhere in bringing about the decadence of the forest, for we read that "The farmers here experienced great inconvenience and alarm from the burning of the woods. Such was the Indian system of clearing the forest." Nov. 5, 1639, applications were made to the Legislature to pass the following: "*Ordered*, That whoever shall kindle a fire in other men's grounds or in any common grounds, shall be fined forty shillings. No fires to be kindled before the first of March." (History of Medford.) Notwithstanding these references, there is no evidence that fires have ever been so destructive in the Fells as they have been in the Blue Hills, and certainly there has been far less mischief wrought by those of recent times. There are several reasons for this. The topography is such that fire and wind cannot sweep without obstruction from one end of the reservation to the other. Spot Pond and the meadows north and south of it make a nearly continuous band that divides the reservation on the east, while Turkey Swamp (now the reservoir) and the streams running from it make a fire guard dividing the western side. These guards lie across the direction of the prevailing winds, but they are broad enough to check fire. Woods roads running in the direction of the wind have always been numerous. Extensive clearings have also served as checks, while browsing has prevented a rank surface growth. It was a practice, too, at one time, on at least two estates (Tudor and Gerry), to employ a man to live on the property to keep out fires and care for it in other ways. It is likely that fires have been more frequent in this reservation than in the Blue Hills, owing to the greater number of people living near the territory; but for the same reason greater efforts have been made to put them out, and they have generally been extinguished before gaining much headway. It is only within a few years that records have been kept of woodland fires, or in fact of any fires in some of the towns about the Fells. Such records of fires as are found indicate that they have occurred almost yearly, but that they have been put out before much territory was burned. In Winchester, where the area burned by different fires is recorded, the largest fire mentioned covered only seventy acres. In these records eleven forest fires in the Fells are noted in the past fourteen years. In the Stone-

ham records no areas are given, but seven woodland fires are noted as occurring within the Fells during the last seven years.

The worst fires of recent years appear to have swept the region south of Spot Pond. Nearly all the sprout land east of Forest Street and south of Spot Pond and the Melrose reservoir has been burned over within two years; on the other hand, the damage done is slight compared with that done in the Blue Hills in the same period.

### *The Existing Growth.*

Never can the views from the hill-tops of the Fells compare in variety, grandeur or extent with those from the Blue Hills; never can the views over water, from hill to hill and to valley, be so beautiful or so varied in the Blue Hills as they may be in the Fells. One could hardly ask for a more attractive combination of land and water. Even the artificially impounded waters of the reservoirs are not suspected to be such until their dams are encountered. Of course the wonderful variety and the grandeur of the primitive forest have long since disappeared; but with all the destruction of two hundred and fifty years there is still much that is beautiful, and there are few dismal wastes of burned and falling brush. Large areas covered with deciduous trees are less frequently spotted by scattered single pines than at the Blue Hills. Where the pine appears it is in large groups, or broad masses that are so well disposed with the surrounding deciduous growths that beautiful landscape effects are produced. Great hemlocks appear in places with the pines, and do much to add to the beauty of the forest scenery.

Semi-detached groups of pine appear along the westerly ridge and down the western slope of Pine Hill. The summit of the next hill to the west has a fine growth of young pines upon it. There are two groups made up of deciduous trees and large pines near the outlet of Wright's Pond. Looking north from the summit of Pine Hill, a conspicuous group of evergreens appear towards the middle of the reservation, over intervening deciduous trees. This is on and near the southern border of Spot Pond. These are the only conspicuous groups of evergreens in the southern section of the reservation. All the territory to the west and north-east as seen from Pine Hill, excepting the cleared and pastured land to the south and east of the lower end of Wright's Pond, seems to be covered with a nearly uniform growth of oaks; but a closer examination shows occasional pines and hemlocks and a very considerable variety of deciduous trees. The group of pines and hemlocks on the south edge of Spot Pond is made up of very fine trees. To the east of these, along shore, the pines gradually thin away among increasing



numbers of deciduous trees. On the east side of Woodland Road is a grove of good pines that again thins out among deciduous trees towards the east along the slope north of Shiner Pool. In nearly all the eastern section deciduous trees predominate, with occasional pines until Virginia Wood is reached. Here is one of the best groves of pines and hemlocks near Boston. These conifers, with some intermixture of deciduous trees, cover the territory adjacent to Pond and Washington streets. A similar growth prevails on lands adjacent to the north side of Pond Street. Scattered large pines are to be found in the woods along Pond Street as far as Old Pepes Cove. In this last section there are also fine groups of old cedars on the tops and slopes of the ledgy knolls near the road. Whip Hill and the greater part of the region about it is covered with deciduous trees. The greater part of the top of Bear Hill is covered with a fine growth of cedar, but on the east side of the top deciduous trees are mixed with the cedars.

The east, north and south slopes of this hill bear a good growth of deciduous trees with a few cedars and a few large pines, the latter increasing in numbers on the south-west side of the hill and there forming good groups. The south slope of Bear Hill is a pasture fast growing up to bushes. On all the territories south of this the prevailing growth is deciduous, with the exception of a considerable clearing partly cultivated and partly pastured, extending from the end of the Winchester North Reservoir to Forest Street, opposite the south end of Deer Hill. North of the North Reservoir deciduous growths prevail, but there are groups of good white pines in a valley north of the three islands, and pitch pines crown a knoll to the east of this valley. There are a few tall pines on the easterly island and a fine grove on the north slope of Grinding Rock Hill, with a grassy clearing to the east of it. There are several smaller groups of pines west of the North and Middle reservoirs, but the finest trees are in the valley in which rise Molly's and Indian springs, and along the edge of the reservation north and south of this valley. These last trees are tall and stately, and they are as conspicuous objects in the view from most of the northern hill-tops as are the fine trees on the south edge of Spot Pond from Pine Hill.

In passing through the forest one very soon notices a marked contrast between the surface covering of the Fells and that of the Blue Hills. No more beautiful walk could be found than that along the old road by the quarries in the valley west of Pine Hill, and up the brook valley into which this old road leads. Almost every kind of tree growing within the reservation is to be found here, and it is doubtful if there is another spot in any of the reservations where so many kinds are so uniformly well developed. The beauty of Virginia



Wood, the Cascade, Spot Pond and its vicinity, has long been known to many people. No lover of nature can spend a day in the Fells without finding several spots that must be deemed remarkably beautiful. There are dense dark thickets and open groves, rocky slopes, smoothly grazed fields, beds of fern and carpets of evergreen foliage; on the other hand, there are many sorely damaged spots which stand in need of restoration. Moreover, even those spots which are now loveliest may undoubtedly be made more permanently and completely lovely by the exercise of watchful and sympathetic care.

In examining the Fells region, an observer very soon notes the fact that the make-up of its vegetation is distinctly different from that of the Blue Hills. The Fells are fourteen miles north of the Blue Hills and a little farther inland. The underlying rocks are somewhat different, and the topography is such that, instead of having a large share of its surface exposed to the full sweep of the cold north winds, as with the Blue Hills, there are only occasional exposed faces and tops of hills. The Fells exhibit little of the mountainous character of the Blue Hills, yet the flora is distinctly more northern. The yellow and black birches are frequently found, the canoe birch once grew in considerable quantities, the sugar maple is not uncommon, the hop-hornbeam and white ash are common, the mountain ash is to be found and the swamp white oak is frequent. These are all species that are not common, or not found, in the Blue Hills. Of the more southern species that are common or frequent in the Blue Hills, the chestnut oak is absent in the Fells, the chestnut is rare, the flowering dogwood and beech are less generally distributed than in the Blue Hills. An examination of the shrub growth confirms this observation, and it is probable that a close study of the herbs will confirm it even more strongly.

#### *Process of Restoration.*

To determine how best to retain and increase present beauty, and how best to improve what is now unattractive, the whole area of the reservation must be studied in detail, so great is the variety of the surface covering. A reference to some of the characteristic growths and to some of the special problems that are to be dealt with will perhaps be the best way of calling attention to the need of special study and skill. Nature's process of recovering the old fields is much the same here as in the Blue Hills. On the other hand, certain plants that are not common at the Blue Hills are much more common here, — for example, the bayberry, lambkill and the introduced privet, barberry and buckthorn. A marked example of the presence of these introduced plants on the site of old habitations is to be noted

on the south slope of Bear Hill. Here Richard Holden built probably the first house in Stoneham not long after 1640, and much of the open land in this region, and south of it at Spring Pasture, has been cultivated since his time. The old pasture on the hill is now full of clumps of the foreign plants, and it seems to have been a centre from which they have scattered in all directions. This pasture was for a long time grazed by cows, but it would have grown up long ago if the owner had not mown the clumps of bushes in the fall for many years. This mowing was discontinued about ten years ago, but the old stumpy bases of the bushes give evidence of this long-continued practice. Comparatively few trees have become established in this old pasture, but they will soon prevail if grazing is discontinued. In the valley south of this the bayberry is the prevailing shrub, but cedars, birches, oaks and other trees are well established, and the territory will soon be a forest in which the birches and cedars will begin to disappear, unless means are taken to preserve this type of growth by grazing and cutting. In the clearing south of the North Reservoir is a territory showing evidences of extensive cultivation. Here are pastures with comparatively little undergrowth, but set with many well-developed trees of cedar, pine, hop-hornbeam, hickory, etc., which should be given every opportunity to become fine specimens and groves with a grassy ground cover, by having the surface grazed and the trees thinned. South of Winthrop Hill is a large territory, now in grass, which might well be kept a hay field. On the edge of this tract next the reservoir are fine oaks and pines, many of which stand well apart in open land, and such a growth should be encouraged. East and north of this is still older pastured land, which is pretty well grown up to trees, but in which there are many well-developed specimens older than the prevailing growth and overtopping it. Such a growth is found in many places in the reservation, and pains must be taken not to allow the fine specimens to be ruined by the poorer trees about them. A considerable territory about the summit of Nanepashemet Hill is rocky and covered with a low growth of sumac, scrub oak, birch, etc., among which are fine vigorous young trees of oaks and hickories, set well apart from each other, that will make beautiful groves if properly encouraged. In other upland territory there appears a growth of sprouts and young trees growing so thickly as to be drawn up, weak and spindling; but in several such places there are found numbers of fine young flowering-dogwoods, which might, by proper thinning, be encouraged to become the prevailing growth, and thus give a territory that now has but little on it that is distinctive or attractive an unusual and distinct type of beauty. In some moist valleys, like that between Forest and Elm streets, above Wright's Pond, are found many young and symmetrical swamp

white oaks, growing among red maples and beeches. These oaks could easily be encouraged to become the characteristic growth and to develop into noble specimens. In some valleys many beautiful individual trees are already developed, for example, in the valley between the quarries west of Pine Hill; but they must be protected and encouraged by the occasional removal of crowding neighbors, if they are to increase in perfection. Again, the top of Bear Hill is covered with a clear growth of red cedars, but on the eastern edge deciduous trees are coming in so rapidly that the cedars will eventually disappear. If it is desirable that this very distinctive feature be preserved, the deciduous trees that are crowding the cedars must be kept in check. On the shores of Spot Pond and its islands young seedling birches are appearing in numbers. Other trees and bushes farther up the bank are crowding down. If the water is to remain at its present level, it is probable that the prevailing growth on the rocky bare strip between the present and the high-water level would be birch. If it is desirable to have more variety, some attention must very soon be given to encouraging the growth of other plants than the birch. The shores of the reservoirs along much of their length have had the trees cut for some distance back from the water. I am told by the superintendent that this was not done purposely, yet he says that it is quite important that the trees be kept back from the water's edge, so as to prevent the accumulation of leaves in the water. To accomplish this the growth of trees next the water must be prevented, while such low shrubs and trailers as the running blackberry, sweet fern, bayberry, etc., are encouraged. The smooth, turfed, formal banks of the reservoir dams are incongruous features in a natural landscape. They would be less incongruous if they were covered with shrubs. Inquiry was made of Mr. W. F. Dotten, superintendent of the Winchester water works, as to the desirability of such a covering on these steep, formal banks; and he states that he had already recommended to the commission that the creepers now growing on some of the slopes be allowed to cover them, on the ground that a saving of expense would result from such a treatment, because the slopes would not require to be fertilized, mown or repaired so frequently, and because they would not be so bare and brown in dry weather. He would not advise the use of deep-rooting trees. There are some places where fire has done such injury that it would be best to kill the old stumps and depend upon the existing ground covering of low shrubs. In other places young trees are coming in, and should be encouraged. In a few places pitch pines cover a considerable surface, and the yellow green of the mass of their foliage is an important element in the landscape. They should often be en-

couraged and other trees among them discouraged. A good example of the value of this tree in the landscape is to be seen in a knoll north of the three islands in the North Reservoir.

To accomplish the best results here, as elsewhere, the work must be directed by one possessed of an intimate acquaintance with the whole reservation, — by one who also is able to frame in his mind an ideal picture that may be made to grow out of the existing conditions of each locality, and then to so direct and protect the growth for a long period of years that the ideal will gradually become an accomplished fact.

#### D. — BEAVER BROOK RESERVATION.

##### *The Original Forest.*

The character and distribution of the vegetation on this reservation indicates that it has been cultivated or pastured for a very long time, and historical records furnish further evidence to confirm this indication. The territory is certainly the most interesting example of an ancient and long-cultivated ground that the commission controls. "On Jan. 27, 1631-2, the Governor (Winthrop) and some company with him went up the Charles River about eight miles above Watertown. They named the first brook on the north side of the river Beaver Brook, because the beaver had shorn down divers great trees there, and made divers dams across the brook." Johnson in 1653 refers to Watertown (which originally included the reservation) as being "a fruitful plot of large extent, watered with many pleasant springs and rivulets, running like rivers throughout her body;" and John Dunton, writing to England in 1686, thus describes this region: "We rambled thro several Tall Woods between the mountains, over many rich and pregnant valleys as eye ever beheld, beset on each side with variety of goodly trees so that had the most skillful gardener designed a shady walk in a fine valley, it would have fallen far short of that which Nature has done without him."

In the streams of this well-watered region the beaver abounded, and the course of Beaver Brook presented a series of meadows and ponds, caused by their dams. It is quite probable that one of the beaver ponds extended along the southerly edge of the reservation, and that others of lesser size were made at the foot of the great swamp white oak and again on the site of the present ponds. It was in the fruitful land bordering this stream and these ponds that the oaks, the hickories, the swamp maple, the sycamores, the ash, the elm, the butternut and many other deciduous trees reached their highest development. Dense forests of such trees undoubtedly once fringed the stream-sides and the pools, and extended over the valleys and



more fertile slopes. On the dry, gravelly ridges and rocky knolls, where the soil was too poor to support this mixed growth, cedars probably predominated, and this growth still persists. It was on the slopes and at the base of the ridges that the white oaks found conditions that were especially to their liking, and here they grew to be the giants of the woods and to outlive many successive generations of the other kinds of trees.

### *The Destruction of the Forest.*

Soon after Governor Winthrop's explorations in 1631 a large colony was established and called Watertown, which Johnson speaks of in 1651, as a place with "land in tillage near upon eighteen hundred acres." At this time the town is said to have outranked all others, excepting Boston, in size and importance. The inhabitants were mostly farmers, and they had many cattle, goats and sheep, and required much room for pasturage.

The centre of Watertown was in the early days within about a mile of the reservation. "At first no man was permitted to live more than a mile from the meeting house, but the Watertown people, being farmers, were soon scattered." Here, as elsewhere, "one of the earliest causes of disputes concerning boundaries arose from the people being cramped for room for the pasturage of their cattle." This want of room did not prevent the citizens from giving early attention to the protection of the trees on the "common lands." They even went further, for a little later than 1637 "a vote was passed to mark the shade trees by the roadside with a 'W,' and fining any person who shall fell one of these trees thus marked, 18 shillings." ("Waltham, Past and Present.") The records of early and important settlements near the reservation make it quite evident that its surface was brought into cultivation or pasturage at an early date; and it is probable that this use of the land has been continuous down to the present time. The Great Meadow, a mile above the reservation, supplied meadow hay, which attracted settlers from Watertown at an early date. The water-power of the stream also was utilized at the falls in early times, for there was at the upper dam in 1819 the decayed ruin of a very old mill, which was removed and replaced by a grist mill. A saw mill was also operated at the lower dam, and later a satinnet mill. This building was burned in 1848, and was replaced by a smaller structure, which has since disappeared, with the exception of a few fragments.

Mr. J. S. Kendall of Belmont (to whom I am indebted for much of the following information about the character and treatment of the land and woods) remembers an old cellar hole overgrown with bushes



and surrounded by plum trees, which was west of the brook not far from where it divides below the lower dam. He says that he and his sister used to pick the plums from these old trees when they passed across lots sixty years ago on their way to school in Trapelo; and he says, too, that fragments of the old trees are still alive. So far as is known, the mill foundations and the cellar are the only indications of ancient structures within the reservation.

It was a practice sixty or more years ago to plough only the best patches in a field, and Mr. Kendall says that in a five-acre patch northwest of the lower pond about two acres were ploughed in patches here and there, in his early life. He says also that all the land between Quince Street and the wall running in a south-east and north-west direction was ploughed and planted about fifty years ago, but that the territory where the great oaks stand was never ploughed to his knowledge, but always pastured. Nearly all the land now covered with trees in the upper section shows evidence of having been cultivated, for garden and pasture plants are still persisting among the trees.

Within the memory of men now living, great oaks, like the Waverly oaks, occupied many of the ridges in the vicinity of the reservation, while much of the territory along the brook above the pond was covered with timber in which white oaks predominated. Mr. Kendall remembers when the first cuttings were made in some of the woods. The white oaks, and nothing else, were the first trees felled, and they were hauled out by oxen. A very large amount of such timber was taken to the Medford shipyards. Even the stumps of the great oaks were dug up with great labor, to supply material for ships' knees; and when a bargain was made for trees it was usually specified that the privilege of digging the stumps should be allowed.

After the oaks the hickories were taken, much of this wood being used for smoking bacon, which was at one time an extensive industry in these parts. This wood was preferred for this purpose because of its sweet-swelling smoke. For the same reason, and also for the reason that it was an excellent fuel, it was called for by the residents of Fort Hill, then the aristocratic quarter of Boston, for their open fires.

The large pines, where they occurred in these woods, were also selected and drawn out. When these kinds of trees were gone there was nothing of great value left in the old woods, so that the remaining trees were generally disposed of at auction to the highest bidder, who then cut everything clean. This clean cutting began here, as elsewhere, between thirty to forty years ago.

*The Present Growth.*

The oak : "He is the gem ; and all the landscape wide  
(So doth his grandeur isolate the sense)  
Seems but the setting, worthless all beside,  
An empty socket, were he fallen thence." — LOWELL.

So overshadowing is the grandeur of the old oaks in the lower section of the reservation that the observer hardly thinks there can be other trees worth considering ; and yet there are fine elms, ashes, maples and sycamores, that are well worthy the attention of visitors. The old pasture plants are especially interesting, too, for here they are more highly developed than in any other reservation. The buckthorns have been growing so long that they have become trees. Old clumps of privet and barberry are here, and with these introduced plants appear also trees of the English hawthorn, which has not gained a foothold in the old pastures of the other reservations. Outside of the wet ground these pasture plants are the only shrubs to be found in large numbers. The great oaks stand well apart, mostly on the slopes of the gravelly esker in the centre of the southern section of the reservation, and on the next ridge to the south. On the east slope and south end of the esker are cedars, pines, buckthorns, hawthorns, privets and barberries, covering most of the surface. The same plants grow generally along the old walls, together with occasional vigorous young trees. On the knoll south-west of the great oaks is a growth of cedars, about which are many young trees. Along the brook and covering the steep bank east of it is a nearly continuous belt of bushes and trees, as far as an old wall which crosses the meadow. From the old wall to the railroad the brook passes through open meadow, then along the railroad bank, through another thicket of trees and bushes that covers wet land to the point where the brook leaves the reservation. In the south-easterly corner of the reservation is a gravel ridge, extending from the railroad bank to the brook, that is covered with a fine growth of old oaks, beeches and maples. The greater part of the surface of the lower section is covered with a short, close turf, in which are many introduced herbs. Between the two ridges on which stand the great oaks there is a bowl-shaped pool, which is usually full of water, as it is fed by springs and a little rill.

The northern section has the greater part of its surface covered with thickets of trees or scattered trees. The two ponds and the wet bottom along the stream occupy a considerable part of the surface. All the wet bottom land, except a little of it along Trapelo Street, is covered with a thicket of trees and bushes full of ferns and flower-

ing plants. On the uplands on either side of the bottom land are patches of hay field, interrupted by trees and groups of trees. The rocky knolls to the north-west are covered with scattered groups of cedars and occasional white and pitch pines, while the wet valleys towards the upper end of the reservation are filled with thickets of bushes and a growth of fine trees, both young and old.

### *Management.*

The two sections of the reservation, being distinct in character, require different methods of treatment. On one section are magnificent specimens which should be preserved, and fine young trees which should be encouraged to make fine specimens. Already the decaying wood has been removed from the old trees, the wounds treated to prevent further decay, and the holes in the trunks that were caused by decay cemented up. The work already done must be carefully watched, to prevent as far as possible all further decay. Young trees that promise to become fine specimens must be encouraged by the removal of crowding neighbors. To keep the close turf in its present condition, pasturing must be continued.

The other section of the reservation is comparatively wild, rugged and tangled, with beautiful patches of wild flowers and ferns, pretty mossy ledges, secluded glens, grassy spots and valleys, dry lichen-covered ledges, tangles of thorny climbing plants and bushes, with some fine trees scattered here and there. It is this peculiar character that must be preserved. The present growth as it develops should be so directed as to enhance the characteristic effect. There are so many beautiful spots here that the few unattractive places are made more unattractive by contrast, and they should be the first to have the unsuitable conditions so modified that nature may redeem them.

A careful watch ought immediately to be set to prevent the destruction of the beautiful flowering plants that add so much to the beauty of the reservation. It may seem like an unreasonable hardship to prevent a child from picking a flower; but a few thousand children would pluck all the flowers in a day, and there would be none for those of the next day to enjoy. This reservation will undoubtedly receive the greatest number of visitors in proportion to its size; and it is here that roads and walks will need to be built at an early date, to which visitors will necessarily be confined. If this is not done every attractive ground-covering plant will be tramped out of existence in a short time. Meanwhile, rigid rules, forbidding the destruction of any form of vegetation, ought to be vigilantly enforced.

Provision should be made at an early date for a border plantation that will screen out present and future buildings standing near the

borders of the park. Nursery ground that is suitable for growing plants for this purpose is to be found on the eastern border of the reservation, near the street.

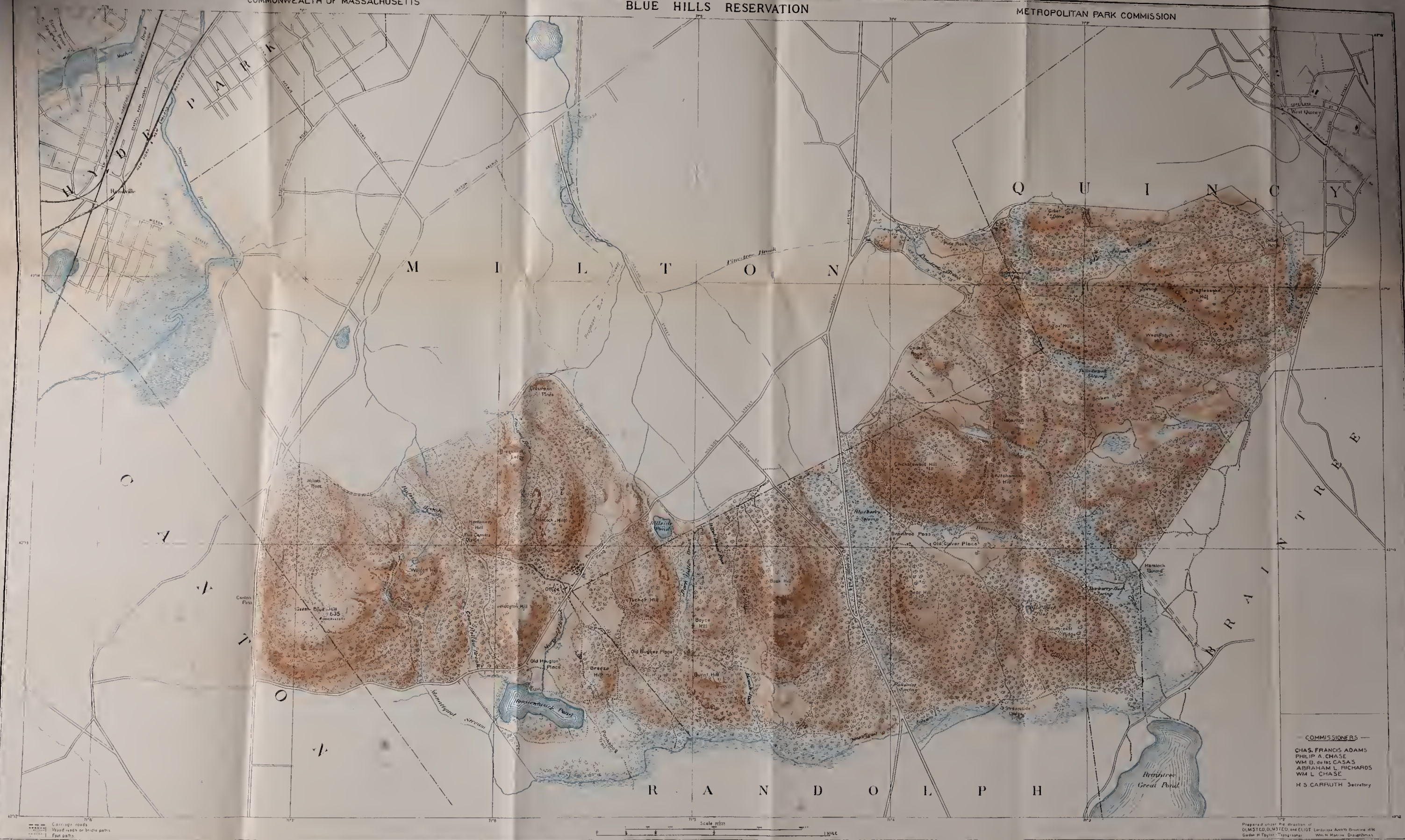
Mr. G. A. Parker, who executed the directions that were given for trimming the great trees, kept a careful record of the amount of labor required to remove all dead wood, cement all cavities and cover all wounds with an impervious coating of tar. The smallest number of cuts that were required to remove the dead wood from any one tree was two hundred and fifty-nine. This tree was the healthy young white oak on the west side of the first ridge, west of Trapelo Street (No. 27). Twenty-eight hundred cuts were required on the largest oak (No. 11). The average number of cuts per tree for the twenty-eight trees operated upon was nine hundred and twenty-one. A man was able to average ten cuts per hour, and the average number of hours required per tree was eighty-eight. The term "cut" includes not only the removal of the branches, but the tarring or cementing of the wounds.

It was surprising to see the great numbers of small dead twigs that were hardly noticeable to a person on the ground; but the most surprising thing was the realizing sense of the magnitude of these trees that dawned upon one as the work progressed. The trees are so well proportioned that it was impossible to realize their size until it was discovered that ladders which seemed almost tall enough to reach the tops of the trees would hardly reach the first branches, and that men who were as busy as they could be all day long could not do in a day the work that was necessary to remove the dead wood and protect the wounds of one of the great branches.

Mr. Parker also measured the height, girth and spread of the one hundred and twenty-one trees which are numbered on the accompanying map of the reservation. Several of the large white oaks measure about seventy feet in height, and spread from seventy to ninety feet.













NOTE  
The Reservation as here shown includes  
lands controlled by the Winchester, Melrose  
Malden and Melrose Water Boards

COMMISSIONERS  
CHAS. FRANCIS ADAMS  
PHILIP A. CHASE  
WM. B. CASAS  
ABRAHAM L. RICHARDS  
WM. L. CHASE  
H. S. CARRUTH, Secretary



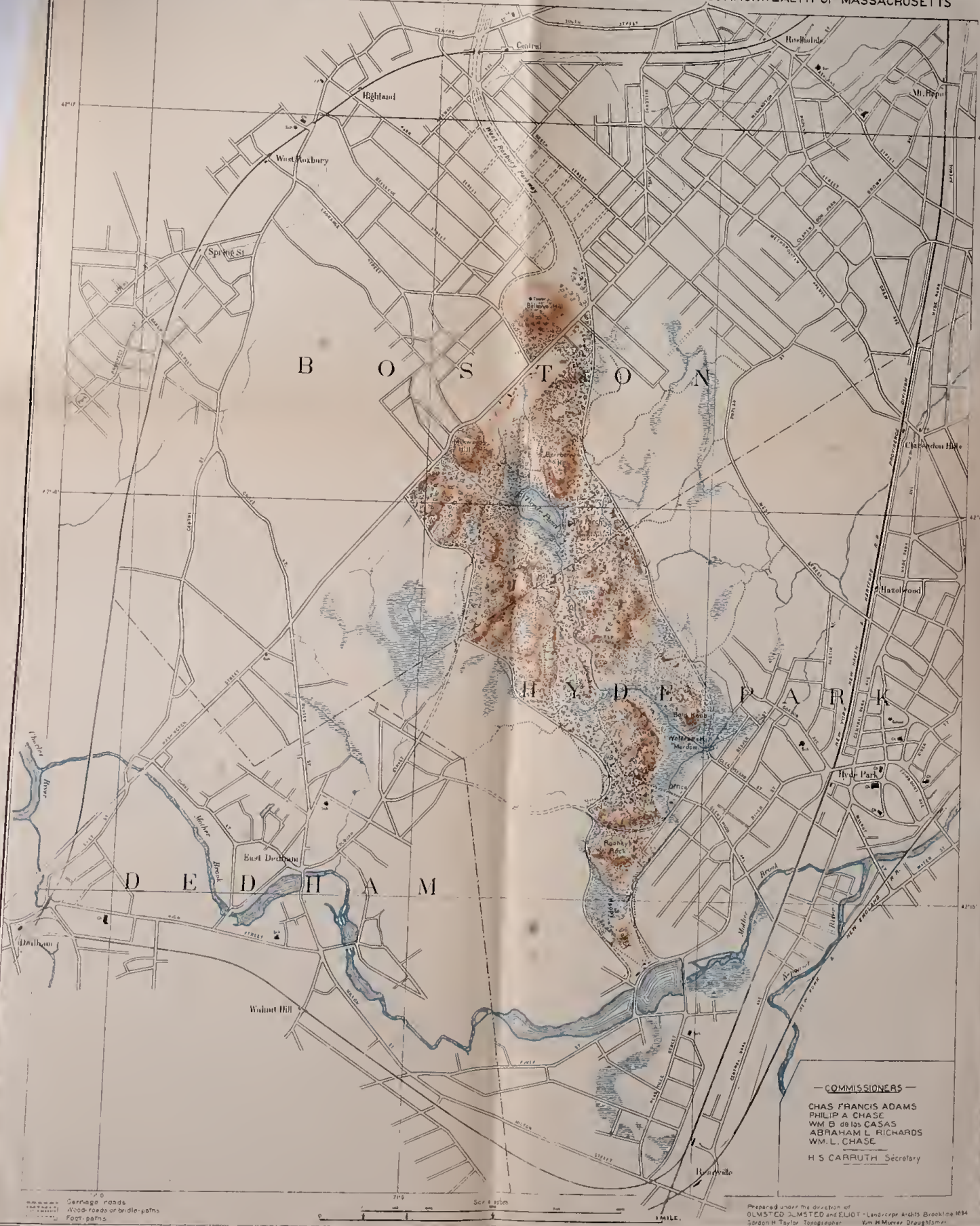
Carriage roads  
Wood roads or bridle paths  
Foot-paths

Scale 1:25,000  
1 inch = 200 feet  
1 mile

Prepared under the direction of  
OLMSTED & SMITH & CO. 1101 Long Ave. Boston, Mass.  
London: W. Taylor & Francis, Ltd. 11, Abchurch Lane, E.C. 4





















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